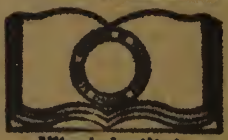
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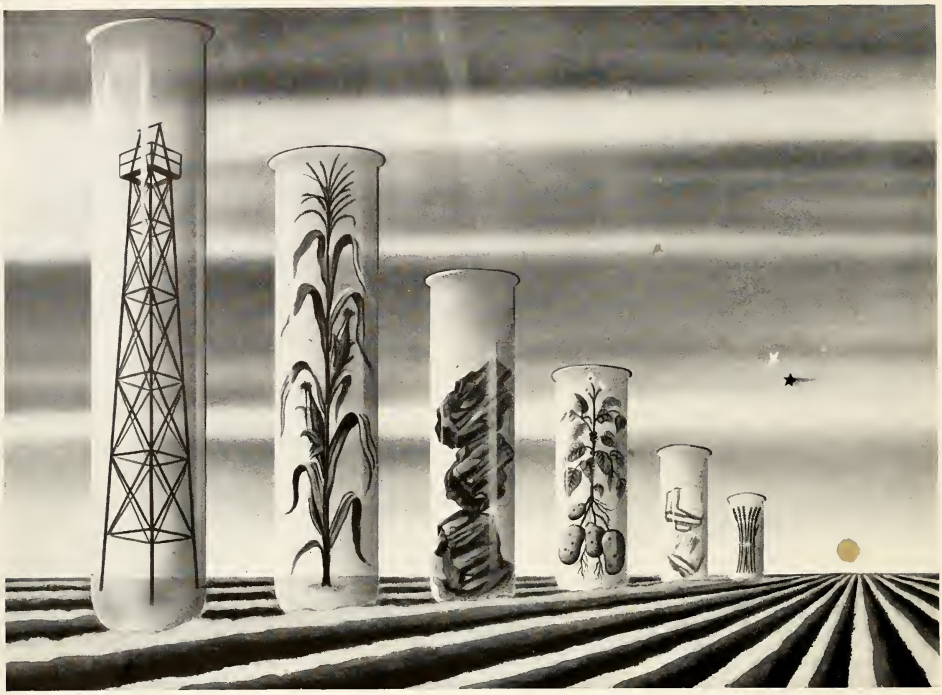
# ILLINOIS TECH ENGINEER

## AND ALUMNUS




OCTOBER, 1943

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# Victory Garden without a Dinner Date

Our whole civilization may depend upon an abundance of such "crops" as these. The petroleum, wheat, corn, limestone, coal tar and other products cultivated in this Victory garden have another war role. They are the source of the basic chemical materials used in the production of synthetic rubber.

Finding ways to produce rubber from these new raw materials was only the beginning. For "chemical rubber" differs from the natural product in many respects, presenting new and challenging problems to the rubber chemist. One of the first that had to be solved was the problem of re-enforcement. Even Buna S, the best all-purpose synthetic, was too low in tensile strength to be practical for tires. So Chemistry came forward with new carbon blacks capable of increasing tensile strength as much as 7 to 10 times that of Buna S alone!

*But tough enough wasn't improvement enough.*

For one of the chief remaining causes of synthetic tire failure was the terrific heat build-up under wartime's severe operating conditions. Wishnick-Tumpeer technicians, working closely with rubber manufacturers in the compounding of the various synthetics, set about developing a special type of carbon black that would give to man-made rubber the necessary heat-resisting qualities.

The result, Witco No. 12, assures a lower degree of heat generation in synthetic tires than could be secured with standard channel blacks.

With tires of synthetic rubber now a practical reality, the next step is to produce the needed volume in the shortest possible time. And here, too, Wishnick-Tumpeer is helping. Already from Witco Research Laboratories has come Witco Softener No. 20, a remarkable plasticizer which saves milling time... Stearite, a highly effective dispersing aid which speeds vulcanization... many other materials that cut the time of fabricating man-made rubber into tires and other essential rubber goods—strengthening the conviction that synthetic rubber is here to stay.

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CHEMICALS

MANUFACTURERS AND EXPORTERS

New York 17, 295 Madison Avenue • Boston 9, 141 Milk Street • Chicago 11, Tribune Tower • Cleveland 14, 616 St. Clair Avenue, N. E.

Witco Affiliates: The Pioneer Asphalt Company • Panhandle Carbon Company • Foreign Office, London, England

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GE Campus News

RESEARCH AND ENGINEERING KEEP GENERAL ELECTRIC YEARS AHEAD



## THE "BAZOOKA"

SERENADES by the Army's "bazooka" corps are getting hands in the air on the enemy front and handclapping from the folks back home.

This new anti-tank weapon, dubbed the bazooka from some remote resemblance to Bob Burns' blowpipe, is small enough to be fired by one man, after a second man loads it. It hurls such a powerful projectile that, after one shot struck a nearby tree, the commander of six enemy tanks surrendered them, believing that he was being shelled by 155-mm. guns.

"It is so simple and yet so powerful," said Major General L. H. Campbell, Jr., Chief of Army Ordnance, "that any foot soldier using it can stand his ground with the certain knowledge that he is the master of any tank which may attack him."

For over a year the bazooka has been in mass production at a General Electric plant that formerly made washing machines and other home appliances.



## THE LIFE OF ITS LIGHT . . .

. . . is only *one* second, yet so short is each flash that it can be used to take 1,000,000 individual photographs! "It" is the 1000-watt MAZDA mercury lamp in General Electric's new "speed-light" camera.

The device consists of a small box weighing less than 25 pounds. The light source is on the front, like a small head light and can be operated manually with a push-button or automatically by electrical contacts or phototube and preamplifier. An ordinary 115-volt a-c household lighting circuit is used to operate the unit.

The lamp itself is about the size and shape of a cigarette and will illuminate 20 square feet of area brightly enough to photo the fastest moving objects. In tests photographs have been taken of a wheel revolving at 70,000 revolutions per minute.

Use of the unit so far has been confined to studying high speed machinery, such as turbines and supercharger parts.



## MAL DE MARS

TIME was when the testing of marine equipment had to be done at sea, aboard the type of ship for which the equipment was intended. Now, however, with machines such as the Scorsby tester in G.E.'s Aeronautics and Marine Laboratory the range of detectors and other equipment can be checked right on land, against a fixed horizon.

The device simulates the roll and pitch of a moving ship—and the resulting seasickness. The time of the ship's complete roll can be duplicated—all the way from the nine seconds for a destroyer to the eighteen seconds for aircraft carriers.

The tester is capable of holding 10,000 pounds and is composed of two huge iron doughnuts, the lower one platformed, which are held about four feet apart by two motor-driven arms. *General Electric Co., Schenectady, N.Y.*

*Hear the General Electric radio programs: "The Hour of Charm" Sunday 10 p.m. EWT, NBC—"The World Today" news, every weekday 6:45 p.m. EWT, CBS.*

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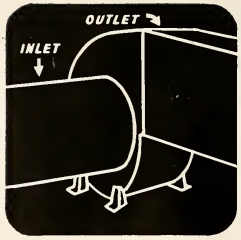


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# Facts

## YOU SHOULD KNOW ABOUT UNIVERSAL BLOWERS



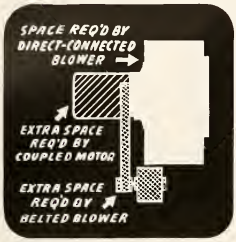




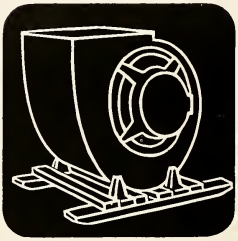


**1** A blower draws in air from one system of ducts and forces it through another system . . . brings in outside air, exhausts "used" or impure air . . . also used for circulating either warmed or cooled air.

**2** Although Ilg makes *both* belted and direct-connected blowers, direct-connected type is usually recommended to save money-wasting friction from reduction of high speed motors through belts, pulleys.







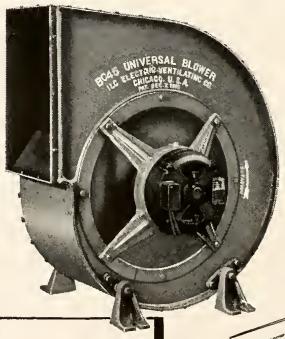

**3** Direct-connection of motor and wheel permits recession of motor in blower housing . . . compact . . requires minimum floor space. Note *extra* space required by belted blower or blower driven by coupled motor.

**4** Each Ilg Direct-Connected Blower is engineered and manufactured as a balanced, integral unit . . . self-contained . . . tested under load conditions . . . shipped completely assembled . . . "factory-set" alignment.

**5** Ilg Blower arrives on skids . . . rolled or suspended into position . . . bolted down, ready to operate. No belts, pulleys or guards to buy, no mounting of motor—no aligning or adjustment on the job.

**6** Install anywhere—on floor, wall, or ceiling. (Many installations are practicable *only* with direct-connected blowers). 64 different discharge arrangements. Direction of rotation quickly and easily changed.

**7** Powered by **all-Ilg-built motors** specifically designed for air-moving applications, each Ilg Direct-Connected Blower is covered by a "ONE-NAME-PLATE" guarantee, including *both* motor and blower . . . assures *undivided responsibility!*




***SAVE MONEY EVERY DAY***—with wheel mounted directly onto motor drive shaft, Ilg Direct-Connected Blowers have a single moving unit rotating on heavy-duty, grease-packed, anti-friction ball bearings. Nothing to get out of alignment or wear excessively . . . no belts or pulleys to be replaced . . . no daily waste of electricity from indirect transfer of power . . . no need for constant adjustment and dressing of belts. You save all along the line . . . on installation . . . on servicing . . . on maintenance. . . . Phone nearby Ilg Branch Office (see classified directory) or send today for FREE booklet.

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# AN EXPRESSION OF FAITH IN AMERICA

RECENTLY, Goodyear dedicated a new home for its bold and manifold research activities, now concentrated on war products.

Gathered here, in vast array, are the most modern instruments of scientific discovery—not only in the fields of natural rubber, synthetic rubber and its kindred plastics—but in fields also ranging even to aerodynamics and metallurgy.

More than a million dollars went into this building and its equipment. It is, we believe, the finest laboratory for its purpose in the world.

But it is not the completion of the structure which we emphasize here.

It is rather the beginning of a new advance—an advance already launched by the limitless demands of war, which will surely gain momentum with the peace to come.

For Goodyear's growth has stemmed not from the accumulation of properties or from finance—but from fertility of the mind and the serviceability of the products which this fertility brought forth.

From the beginning Goodyear has steadfastly stressed research to advance the usefulness and value of its products.

It was this constant quest for improvement which, in the early days, originated the first straight-side tire.

It brought forth the first pneumatic tire for trucks and farm tractors—the first low pressure tire for airplanes.

It brought cotton, rayon and nylon cord tires to their high perfection.

It produced Pliofilm and Airfoam, twin advances in packaging and cushioning.

It developed the never-equaled Compass transmission belt.

It perfected bullet-puncture-sealing fuel tanks for airplanes.

It enabled America's first *all-synthetic* tire, produced by Goodyear in 1937.

And for 28 years now, it has won popular tribute, expressed in the fact that more people ride on Goodyear tires than on any other kind.

We cannot predict what this laboratory will bring forth in future.

But in the realm of possibilities—from the developments spurred by war—is such a range of products as nailable glass, wafer-thin insulating materials, hundred-mile conveyor belt systems, non-freezable plastic water pipes, metal-wood laminations for car and airplane bodies, mildewproof tents and awnings, static-free radio, all-welded airplane fabrication, crashproof airplane fuel tanks, and many like wonders on which we are now at work.

These will dictate in significant measure "the shape of things to come," forecasting the fullness of life which is ours to conceive and realize when peace returns.

So what we have dedicated is not a building, but the talents which this building is built to serve.

It is our aim to make it forever true of Goodyear, as of life in America, that "the best is yet to come."

Pliofilm, Airfoam, Compass—T. M.'s The Goodyear Tire & Rubber Company

GOODYEAR

THE GREATEST NAME IN RUBBER




# "The most fascinating business in America"

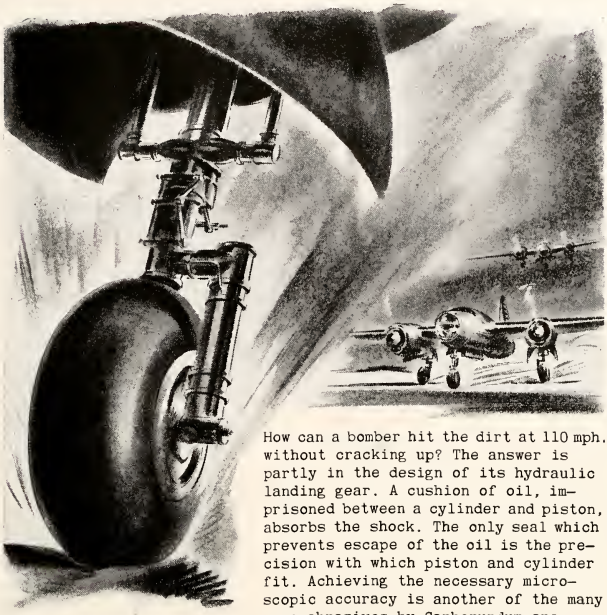
The unlocking of the treasure house that lies sealed in a lump of coal has been called the most fascinating business in America. It touches every industry. That is why Koppers has been called the industry that serves all industry. Here are some materials which Koppers supplies to the chemical industry . . . . which is only one of dozens of industries it serves in comparable manner. Koppers Company and Affiliates, Pittsburgh, Pa.



**KOPPERS**

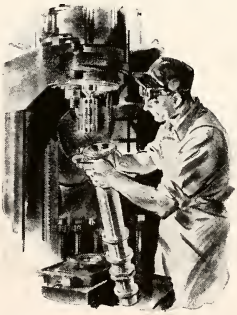
THE INDUSTRY THAT SERVES ALL INDUSTRY

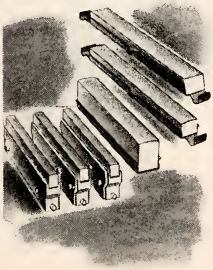
# Landing at 110 mph. on a cushion of oil...



How can a bomber hit the dirt at 110 mph. without cracking up? The answer is partly in the design of its hydraulic landing gear. A cushion of oil, imprisoned between a cylinder and piston, absorbs the shock. The only seal which prevents escape of the oil is the precision with which piston and cylinder fit. Achieving the necessary microscopic accuracy is another of the many ways abrasives by Carborundum are helping to build our machines of war.

The interior surface of the landing gear cylinder is finished with a honing machine, as illustrated, fitted with abrasive sticks made by Carborundum. Similar honing machines are helping to produce engine cylinders, bearing races, and thousands of other products requiring an accurately finished internal cylindrical surface.

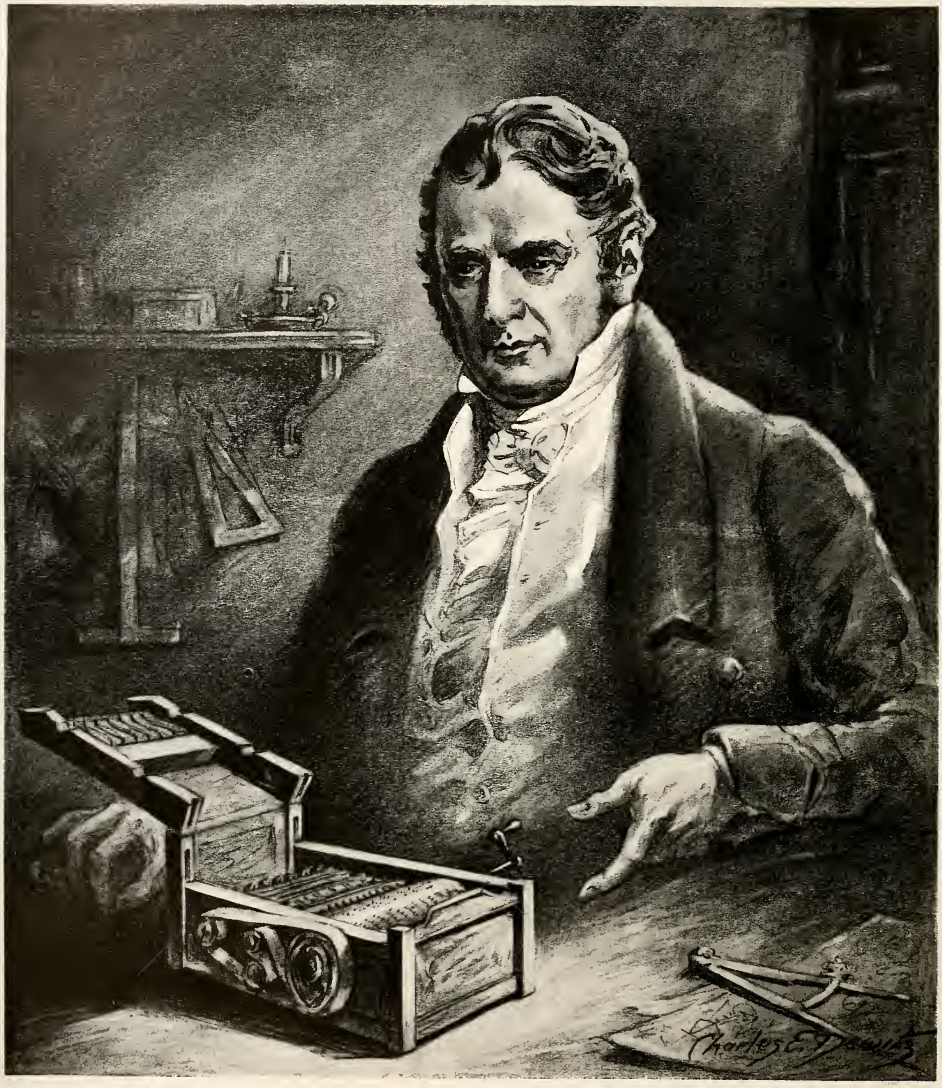




The future holds many possibilities for new uses of abrasives. When you take your place in industry, keep Carborundum in mind. The Carborundum Company, Niagara Falls, N. Y.

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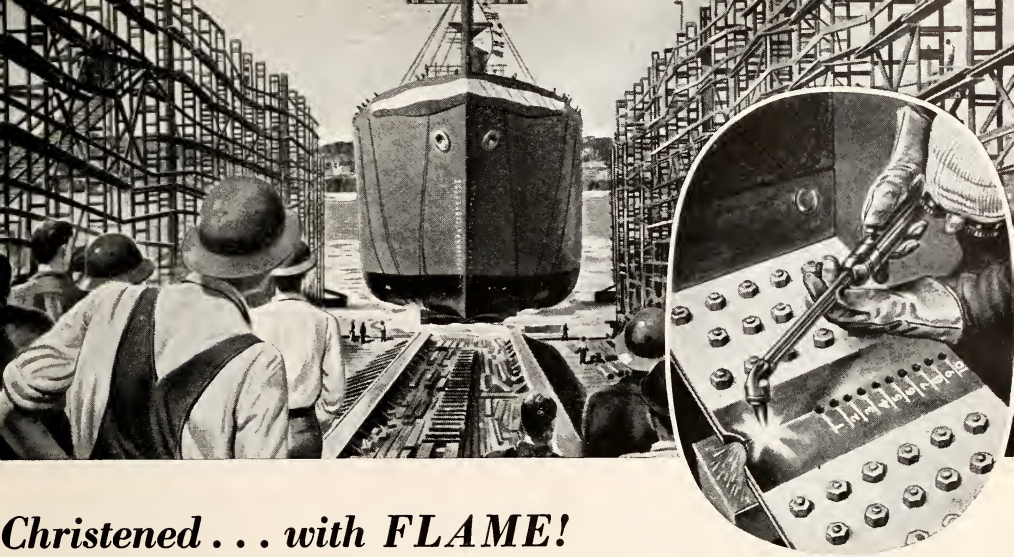
# ELI WHITNEY AND HIS COTTON GIN

Eli Whitney, a New England mechanical genius, by his invention of the cotton gin in 1793, started a chain of events involving the agricultural development of the South, the industrial growth of his own part of the country, and the clothing of all the peoples of the world.

The cotton gin made it possible to remove the seeds from cotton cheaply and quickly. By supplementing the old processes, which were so slow as to make it uneconomic to raise cotton on a large scale, the machine was a principal factor in the development of the cotton revolution. It influenced the history of the South and of the nation.

He was active in other fields of invention and industrial production, and was a pioneer in the development of standardization and interchangeability, especially in relation to military small arms, but his fame rests most securely on his cotton gin.

CROWE NAME PLATE & MANUFACTURING COMPANY, Chicago



# *Christened . . . with FLAME!*

FLAME . . . as well as champagne christens ships. The last act that frees a ship from the ways is the cutting of steel bonds by oxy-acetylene flame. This swift cutting of steel typifies the way the oxy-acetylene flame is speeding the fabrication of ships, aircraft, locomotives, guns, shells, tanks, and hundreds of other vital articles made of metal.

All over America, this flame cuts time and gives to mass-production industries a means of manufacturing faster, better, and at lower cost. Since the white-hot oxy-acetylene flame cuts through metal as easily as a saw through wood, it makes steelworking as simple as carpentry! From the time steel is made . . . until it is finally cut up for scrap and sent back to the steel mills for a new lease on life . . . oxy-acetylene flames expedite its treating, cutting, and fabricating.

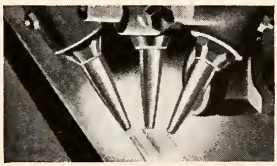
The oxy-acetylene flame is not new. Oxygen, acetylene, and many machines and techniques for treating, cutting, and fabricating metals have been made available to industry for years by THE LINDE AIR PRODUCTS COMPANY, a Unit of UCC. The present wide application of Linde's peacetime research and development . . . coupled with the great expansion of Linde's oxygen-producing and engineering facilities *before* the emergency arose . . . are contributing vitally to this country's mass output of the things it needs. These products and processes—plus new ones that are stemming from today's continuing research — are important among the mass-production tools that can be used in the future to bring you better cars, trucks, tractors, washing machines, refrigerators, and many other things for better living at lower cost.



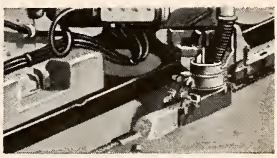
**LIQUID OXYGEN!** The demand for oxygen today is great. Driox liquid oxygen has made it possible for mass-production industries to be supplied in bulk. Liquid oxygen—occupying only 1/862 of the volume of gaseous oxygen—is shipped in tank cars and tank trucks and converted to gaseous oxygen as needed.



**SPEEDING QUALITY STEELS!** Production line efficiency in removing surface blemishes from new steel became possible with the Lin-de-Surfacer scarfing machine. Huge mechanized batteries of oxy-acetylene flames "skin" hot steel . . . quickly and economically . . . resulting in higher yields of quality steel.



**KNIVES THAT NEVER DULL!** Oxy-acetylene flames held in mechanical arms trim and bevel steel plates for welding in a fraction of the time required by methods formerly used . . . cut in straight lines, circles, or in irregular patterns. The flames are also used to harden and soften metals and to prime them for painting.



**MECHANIZED WELDING!** "Unionmelt" electric welding automatically joins steel plates as much as 20 times faster than any similarly applicable method . . . and does it without noise, fuss, or sparks. This process complements the hand and mechanized methods of welding with the oxy-acetylene flame.

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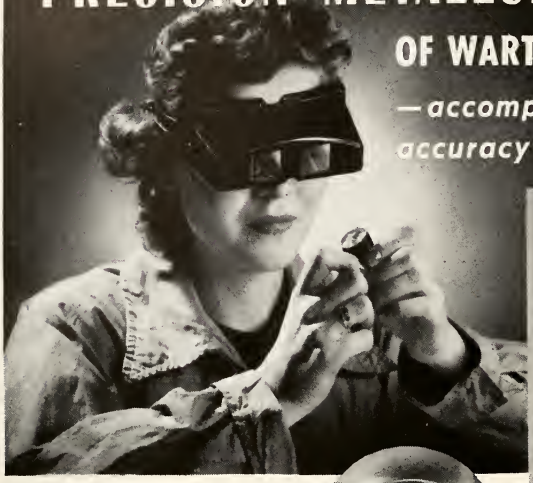
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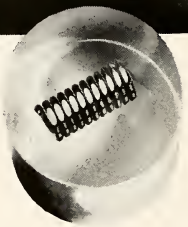
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Every piece of metallurgical testing equipment manufactured by Adolph Buehler is distinguished for its mechanical precision. This is but a reflection of Mr. Buehler's long experience in the field of optical instruments, where precision and accuracy achieve their highest expression. The functional design of Buehler equipment is a development of daily personal contacts with metallurgists and their problems.

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## NEW SPECIMEN MOUNT PRESS

Designed to provide the utmost in ease and speed of making transoptic mounts. Constructed with a rugged simplicity that will give long service and precision built for accuracy. The molding tools are lapped finished for close tolerance with a perfect fit. Either 1" or 1¼" molds may be used with ease on the AB presses. The new design retains the solid heater which brings the mold to top temperature faster; however, on the new model, it is not necessary to release the pressure before cooling the sample. This is accomplished by sliding the heater up the mold onto a holder pin and swinging a pair of finned cooling blocks into position, where they are held by a locking lever. The heater and cooling blocks need not be removed from the press. This keeps them out of the way and prevents accidental burns.



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# SLICING DAYS OFF SHIPBUILDING SCHEDULES . . .

UNTIL recently, cutting hatchway openings out of heavy deck plating was a bottleneck in the construction of certain types of ships. It was a slow, costly job requiring many laborious machining operations.

Could the oxyacetylene flame eliminate this bottleneck? This was the problem presented to Airco's research engineers by one of its customers. The problem was solved by an entirely new gas cutting machine, designed and constructed specifically to handle this job.

With this machine it is possible to cut beveled openings, rounded at the corners, out of thick steel plate—all in a single continuous operation! The finished cut is smooth and clean, and more important, the openings are cut in 1/120th the time required by the former method. Today this machine—the Airco Polygraph—has become standard equipment in shipyards and many other war production plants throughout the country.

This development is typical of the achievements resulting from the teamwork of Airco engineers and its customers—each contributing their specialized knowledge towards one common objective.

If you want to keep posted on some of the most recent developments and applications of oxyacetylene flame and electric arc processes, write for a free copy of the illustrated booklet, "Airco in the News." Please address your requests to Air Reduction, Room 1656, 60 East 42nd Street, New York.

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*Official U. S. Navy Photograph*

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That's what the Navy calls a torpedo. But it isn't made of tin. It's made of steel and brass and monel — AND IT IS MADE OF DOLLARS. WAR BOND dollars make this aerial torpedo possible.

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**WITH WAR BONDS**

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General Offices — Greenview at Diversey Parkway — CHICAGO, ILLINOIS, U. S. A.

## Contributors

**David P. Boder** is professor of psychology at Illinois Institute of Technology.

**George W. Booth** is chief engineer of the National Board of Fire Underwriters, and has been with the Board since 1904. He is a civil engineering graduate of Worcester Polytechnic Institute, and after graduation was with the Massachusetts Metropolitan Water Board. He is a life member of the American Society of Civil Engineers, an honorary life member of the National Fire Protection Association, and a member of the American and New England Water Works Associations.

**Yale Brozen** is assistant professor of economics at Illinois Institute of Technology.

**Francis Godwin** is assistant director of the Armour Research Foundation.

**Clarence A. Herbst** is a graduate of the Institute in the class of '22. He is plant superintendent for the Economy Fuse and Manufacturing Company.

**C. J. Hogue** is a structural engineer, a member of the American Society of Civil Engineers, and director of technical service for the West Coast Lumbermen's Association.

**V. I. Komarewsky** is research professor of chemistry at Illinois Institute of Technology.

**J. S. Kozacka** is associate professor of mechanical engineering at Illinois Institute of Technology.

**E. C. Paustian** has until recently been assistant professor of sociology at Illinois Institute of Technology.

**Harry P. Richter,** a graduate of the Institute in the class of '32, is a real estate engineer with Carnegie-Illinois Steel Company.

**John J. Schommer** is director of athletics, director of placement, and professor of industrial chemistry. He is a special adviser to the selective service system.

**Herbert A. Simon** is assistant professor of political science at Illinois Institute of Technology.

**C. A. Tibbals** is professor of analytical chemistry and dean of students at Illinois Institute of Technology.

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The cover picture shows a 136-foot all-wood submarine chaser, typical of fighting vessels now being built of Douglas fir. **Official U. S. Navy Photograph.**


# ILLINOIS TECH ENGINEER
AND ALUMNUS

OCTOBER 1943
VOLUME 9 NUMBER 1


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# FIRE LOSS PREVENTION

## A Brief History of the Engineering Work of the National Board of Fire Underwriters

By
GEO. W. BOOTH

Even before he had reached a stage of development where he built a home to protect himself from the elements, man was a victim of fire. With the animals of the fields and forests he would have to flee before the scathing heat of a forest or prairie fire, started often by his disregard of common preventative action but also produced by lightning or the spontaneous heating of nature's waste.

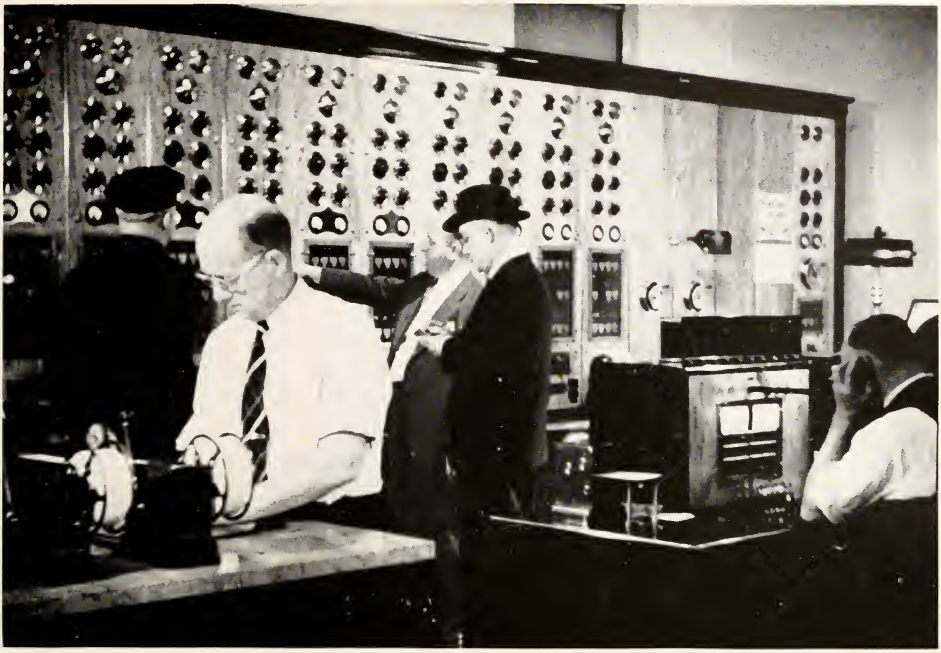
With the coming of cities the scourge of fire became such that definite steps had to be taken to combat it. History tells of Roman fire fighters, and some ancient laws had requirements dealing with the problem of fire safety.

The early modern developments of fire prevention and fire extinction were those sponsored by the fire insurance interests, which became an active factor after the great fire in London in the seventeenth century.

In America, the organization of fire brigades was well under way before the Revolution, and some action had been taken in the line of fire prevention. This last was in part through the passage of laws applying to building construction, but was largely the application of common sense to such

Firemen Are Given Training In Well Equipped Drill Schools.





A Portion of a Fire Alarm Central Station.

matters as chimney construction, the location of stoves and the separation of buildings so that all would not become involved in a fire starting in one of them. In the cities, an important safeguard was the adoption of fire limits, within which buildings were required to have brick walls.

Full realization of the seriousness, from an economic standpoint, of the destruction of the nation's wealth by fire dates back only a little more than a third of a century. The conflagration which swept the business district of Baltimore in 1904 emphasized the probabilities existing in American cities of losses in wealth which might seriously affect the business structure of the country.

The National Board of Fire Underwriters, an organization of Capital Stock Fire Insurance Companies, which, since its organization in 1866, had done much to increase the fire safety of business and the home, realized that there was urgent need for extensive and intensive studies of the problems of fire prevention and fire extinction, and that to make these an engineering organization was needed. Such an organization was established in the fall of 1904, under the direction of the so-called Committee of Twenty, which was succeeded by the Committee on Fire Prevention and later by the present Committee on Fire Prevention and Engineering Standards.

The first work of the engineering staff of the National Board of Fire Underwriters was the surveying of the larger cities of the United States, that is, those of over 25,000 population. This work consisted of a detailed inspection of the water-supply system, from the source of supply through pumps, mains and hydrants, to determine the adequacy of the water system to deliver the necessary quantity of water at and around any possible fire. The study also included reliability of the supply. Would it be seriously reduced from any cause, such as a drought, a broken pipeline, the break-down of a pump or boiler, or any one of many other probabilities?

Even with plenty of water, there must be men and means to get it onto the fire. This part of the fight against fire comes within the domain of the fire department, with its auxiliaries, the fire alarm service and the police service. These must all be studied and analyzed. There are other large factors involved in the likelihood of a fire destroying an individual building and of its spread to others and to a large part of the city. These factors are, first, the vulnerability of existing buildings, and second, the improvement which can be made through a better control of hazards and a better type of building construction for all new and repaired buildings.

Improvements to the water supply, the fire department and the fire alarm service are problems which can be worked out, as they are of an engineering nature. They also are susceptible of early correction, depending only upon the financial ability of the community to carry them out. The results of these surveys are prepared in printed form, with recommendations, and distributed to the principal officials of the community, as well as to the insurance company members of

the National Board of Fire Underwriters.

Since the inception of this work of aiding the larger cities to better their fire fighting facilities, similar work has been started by the various regional fire insurance organizations for the smaller cities, towns and villages. In this manner errors of design are corrected, and throughout America there has been an ever increasing improvement in facilities to combat the spread of fire.

With the entrance of the United States into the World War in 1917, there was great need for large camps for the army which had to be trained. No plans had been prepared for this work, but weeks before the first of these cantonments could be started, experienced engineers of the National Board of Fire Underwriters had been loaned to the War Department. With their cooperation, water-supply systems were strengthened to provide fire protection, fire apparatus and hose were purchased, soldiers were regularly assigned to fire companies, and trained fire officers were appointed. In addition, engineers of the National Board of Fire Underwriters were assigned to the various cantonments during construction.

As the war progressed, other fire protection work was undertaken. Men were assigned as advisors and fire inspectors in the Navy Department, the Emergency Fleet Corporation and the War Industry Board.

That the work of the National Board of Fire Underwriters and the other insurance engineering service organizations was of value is proven by the present attitude of the various government departments on which depends the success of the present war. Working upon recommendations of the National Board of Fire Underwriters during the previous World War, the General Staff of the Army had complete plans for fire protection of typical camps and especially for airfields, depots and warehouses. In like manner, the Navy has spared no expense to provide fire protection in Navy developments and to require it in shipyards building the Victory Fleet.

Even though much of this wartime fire protection could be and was planned ahead of time, the Army, the Navy and the Coast Guard have deemed it a privilege to make dollar-a-year contracts with the National Board of Fire Underwriters, under which some of its engineers are assigned to the various department offices in Washington, and other fire insurance engineers have made hundreds of inspections of departmental developments throughout the United States and in some of its possessions and territories. That work could never have been accomplished successfully without the whole-hearted cooperation of the insurance boards and bureaus throughout the country.

So far this article has been concerned largely with fire fighting facilities. There are other factors which largely influence the starting of a fire, its magnitude and its spread to other structures. These features are largely those which can be divided into two groups—fire hazards, and structural conditions.

Much of the material used by man is burnable, some more so than others. Knowledge of the various characteristics of these materials, especially of their ignitability, is highly essential. For these reasons the engineers of the National Board of Fire Underwriters, as part of their city inspection work, have urged the establishing in each city of a fire prevention bureau, the object of which is to see that hazardous materials and processes are safeguarded, thus reducing the probability of fires.

Fire prevention work has long been actively carried out by the fire insurance interests. Only in recent years has it been brought to the front as one of the most important duties of such regulatory bodies as national, state and city departments. At this time of national peril, all of these departments are placing great stress on fire prevention, especially that which is provided by the installation of automatic sprinkler systems.

Much of the data available in carrying out fire prevention is that which has been prepared by the engineers of the National Board of Fire Underwriters, and the affiliated fire insurance organizations. However, it would not be proper if no mention were made of the great work which is being done along this line by Underwriters Laboratories, the National Fire Protection Association, and many other associations, such as the American Petroleum Institute, the Compressed Gas Manufacturers Association, the American Gas Association and the International Association of Fire Chiefs.

Looking at it from the engineering viewpoint, one can very readily see that fire prevention must involve other things than the personal equation of



Hose Outlets and Gages on a Modern Fire Department Pumper.

carefulness. Segregation of materials, kind and place of storage, method of use, and kind of protection are some of the items. These require knowledge, and it is almost axiomatic that to solve the problem will also involve considerable cost and manpower. Studies have shown that effective carrying out of fire prevention can be had only where there are mandatory provisions made for the enforcement of reasonable safety requirements.

With the above thought in mind, it has been the practice of the National Board of Fire Underwriters to urge the adoption by cities of suitable ordinances controlling hazards. To provide a basis for this, suggested ordinances have been issued, to be used as a guide by the city or state in the preparation of suitable laws. This class of work requires engineering knowledge in the widest sense, especially in these days of rapid expansion through chemical engineering. One of the principal objects of the present work of the National Board of Fire Underwriters is to provide, in readily understood form, the knowledge which firemen, plant protection engineers, and the general public must have to eliminate these ever-developing hazards of industry.

No one feature influences the American city, as respects the probability of fire involving large losses of property values and injury to many people, to the same degree as does that of the construction of buildings.

For half a century the National Board of Fire Underwriters has had, as one of its principal objects, the adoption by cities and towns of suitable building codes. It must be recognized that timber and other combustible materials are of great value in the construction field, and further, that the use of incombustible building material does not necessarily make a fire-safe structure. Indeed, all these materials can be used under proper restrictions of design and with certain safeguards as to location and use.

The National Board of Fire Underwriters has issued several editions of a *Recommended Building Code*. The value of this has been well illustrated in connection with modern industry. Most industrial plants have accepted the basic policy that automatic sprinklers largely offset certain features of building design, especially excessive floor areas, which would otherwise prove to be a sure cause for total destruction.

With the inception in 1904 of the advisory service to cities in regard to fire fighting facilities the engineers of the National Board of Fire Underwriters were confronted with the fact that there were no standards to which reference could be made.



Measuring discharge from a large nozzle by means of a Pitot Tube and gage. Note lashing to withstand the reaction.

Water works, starting from the simple system of bored logs to bring water from a spring to the places of residence, had been developed to the point where an ample supply was piped into all buildings, and in addition water was available, through hydrants, to the city fire fighting force. On this last feature, little was definitely known about the actual quantity of water which was available in the various parts of the city, with the result that at serious fires the fire engines could not be operated at their capacities. In many instances a full and complete study had never been made with a view to reducing the probability of a complete shut-down of the water service.

To bring to the attention of the city officials the condition of their water systems, the engineers of the National Board of Fire Underwriters ran flow tests to measure the available supply from hydrants, checked the arrangement and condition of pumps, boilers, electric motors, filters, mains, gate valves, and hydrants.

In like manner, complete engineering studies were made of the fire departments. This included investigation of the organization, officers, manpower, location of fire stations, equipment and drills, training, and operation. It was soon recognized that the effectiveness of the fire-fighting facilities was influenced by the character and condition of the alarm system, the cooperation of the police, the amount of local plant protection, the aid available from other communities, and also the topography of the city, the condition of the streets, and winds, snow and other weather conditions.

Every city or town has features which influence the probability of serious fires, such as the kind and size of buildings, width of streets, congestion or distribution of high values, and the location of parks or other open spaces. Probably the most important factor in the potential hazard is that bearing upon the construction of buildings, which, where there is no building code, often have defects which greatly influence the probability of serious fires.

As a result of the studies made by the engineers of the National Board

(Turn to page 44)

# THE ARMED FORCES AT ILLINOIS TECH

By
C. A. TIBBALS

Illinois Institute of Technology has upon its campus, as a major factor in its war service to the nation, some 1200 full-time students of engineering who are enlisted in the armed forces. These men are all included in two military units: about 700 apprentice seamen in a V-12 unit of the Naval Reserve, and 500 privates, Army of the United States, in a service unit of the Army Specialized Training Program.

Navy V-12 and Army Specialized Training Program have a common objective, which is to provide technical training for selected young men, physically, mentally and culturally qualified as potential officer material, in order that these men may serve the nation in the armed forces at their highest level of capacity in the general field of engineering and science. The methods of selection of personnel by the two services and the planning of their educational programs, differ markedly, although not fundamentally.

Navy V-12 trainees are, essentially, college students of all classes, freshman to senior, qualified through meeting the rigid physical requirements for officer material, through attaining high scores on standard mental tests, and passing satisfactorily in interviews with qualified personnel boards. These men, all without previous military experience, are inducted into the Naval Reserve, placed on active duty, housed and messed on or near the campus, and integrated in the regular program of Armour College of Engineering, in courses indicated by their previous academic experiences. Naval regulations allow a maximum of eight semesters' work, which would permit a current freshman to complete a curriculum in civil, electrical, fire protection, or mechanical engineering in two and two-thirds years under the accelerated program of three terms per calendar year. Students with advanced standing can complete their degree programs proportionally sooner. The Navy V-12 man, then, is essentially a college student, inducted into the Navy and wearing the uniform of an apprentice seaman. His course in Armour College differs from that of the civilian student only in an intensified program of physical training and in one two-hour course in Naval History and Customs.

The 3666th Service Unit, Army Specialized Training Program, is a battalion of trained soldiers of the Army of the United States. The members of the unit have had at least the thirteen-week basic training period at camp, and have been selected through competitive tests from large numbers of volunteers for the training program. The men of this unit are, in

(Turn to page 44)



LT. W. A. HAMILTON



LT. (j.g.) M. P. ANDERSON



CAPT. G. L. HUDSON

# SOCIAL SCIENCE RESEARCH AT ILLINOIS TECH

By
YALE BROZEN and HERBERT A. SIMON

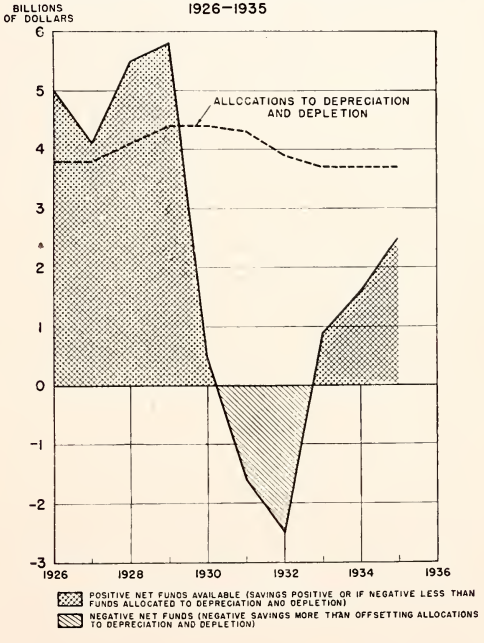
When the physical scientist thinks of research, he thinks of a laboratory with its test tubes, or voltmeters, or electron microscopes, or atom-smashers. The social scientist must carry on his work with no equipment more glamorous than a questionnaire, the Compiled Statutes of Illinois, and perhaps, if he is statistically inclined, an electric calculating machine. As a matter of fact a laboratory, however equipped, would seldom be of any use to the social scientist, for he is not often in a position to conduct controlled experiments. Like the astronomer and the geologist, he must take his data as they come.

Perhaps the greatest obstacle to the social scientist is that his data are human beings, for it must be admitted that human behavior is the most complex, erratic, and generally intractable phenomenon that science has occasion to deal with. Physicists frequently encounter hysteresis phenomena, where the past history of a system influences its behavior; social scientists are confronted, in addition, with a sort of "reverse" hysteresis, where the expectations of individuals regarding the future influence their present behavior.

Research in the social sciences, as in the physical sciences, has a scientific aspect and a technical or "applied" aspect. In its purely scientific aspect, social research is directed toward the discovery of truths about the political, sociological, and economic relationships of men. In its technical aspect, social research is concerned with devising or discovering means of social organization for accomplishing given ends and satisfying accepted human desires. The distinction is the same as that between research in alternating current theory, and design of power transmission systems.

Social research is profoundly affected by human interests, meanings, and values—a fact which makes scientific analysis especially difficult. To obtain valid results, value judgments

**CORPORATE FUNDS DERIVED FROM OPERATIONS AVAILABLE FOR CAPITAL FORMATION 1926–1935**

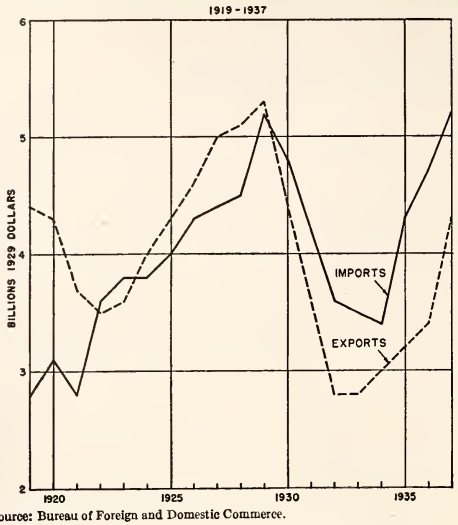



## FINANCING TECHNOLOGICAL CHANGE

**The introduction of technological improvements requires new plants and new equipment. Corporations are obtaining an increasing portion of the funds which are required to finance this progress by "plowing back" their own earnings.**

This and following graphs from *The Structure of the American Economy,* National Resources Committee, June, 1939.

U. S. IMPORTS AND EXPORTS OF GOODS AND SERVICES




Source: Bureau of Foreign and Domestic Commerce.

## AMERICA'S FOREIGN TRADE

**Foreign trade provides an important outlet for American manufactures, and an important source for raw materials. Tariff policies and economic conditions cause wide fluctuations in the flow of trade.**

must be separated from scientific judgments, yet such separation is sometimes highly difficult. The social scientist attempts to leave the question of what *ought* to be to ethics, and to devote himself solely to the discovery of what *is*.

Social research in its technical aspect has a particularly difficult time avoiding this confusion between scientific judgments and value judgments, for social means and ends are not completely separable. Means shape the quality of ends, and often they become ends in themselves. We think, for example, of freedom of speech as a desirable end in itself, but it is also an indispensable means for the maintenance of democratic political institutions—without free speech, democracy could not exist. In the case of those social problems where the line between means and ends cannot be sharply defined, the social scientist has no right to propose "solutions" which are biased by his own personal values. Instead he has the more modest, albeit more difficult, task of educating the members of the general public to an awareness of the consequences of their decisions and the conflicts among the various values they seek.

A particularly significant field of social science research, lying on the borderline between the social and physical sciences, concerns itself with the impact of our modern industrial society on social organization and human behavior. It is for the most part in this area that the research interests of the social science faculty at the Illinois Institute of Technology lie. This is only natural, for it is in this field that the library and research facilities of a technical institute can be most useful to the social scientist, and it is to this field that his contacts with engineering faculty and students, and their common interests, will direct his attention.

There is probably a process of natural selection which also helps to account for these research interests. A social scientist whose research work has brought him into contact with modern technology is far more likely to be aware of and interested in the problems of social science curriculum and instruction in an engineering school than is a social scientist whose research has been in some other area. Hence, the former is more likely than the latter to be attracted to the faculty of an engineering school, and to find in his teaching experiences at such an institution a stimulus to productive research.

Members of two departments—industrial engineering, and political and social science—are engaged in social science research at the Illinois Institute of Technology, and their work ranges from management problems to international economic relations. The brief descriptions given here of some of these research projects will give some indication of their aims, and their relation to engineering problems. We have not included in this account industrial engineering research in production methods which properly lies in the area of the physical sciences, rather than in that of the social sciences.

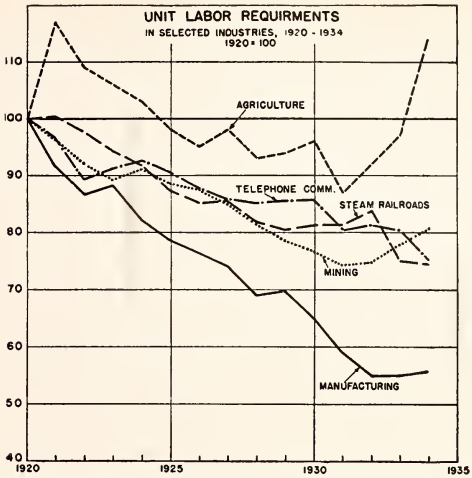
Before the engineer can put his new ideas, his inventions, and his technical improvements to use, he must obtain the funds to build the required plant and equipment. It has been the function of the investment banker in our society to make available these funds, to decide which projects were likely to be most profitable and to justify the risk of capital. The functioning of the market for new capital has never been perfect, and in recent years many corporations have turned to their own savings as a source for new investment funds, or have negotiated directly with large investors like the insurance companies. Small business firms particularly have found difficulty in securing adequate long term credit.

This problem has become of international moment in connection with plans for post-war international economic cooperation, and the British and American governments have already proposed alternative schemes for international control of credit. Rollin H. Simonds, of the industrial engineering department, is now working on a critical analysis of Assistant Secretary of State Berle's proposal for the creation of a system of capital credit banks. Mr. Simonds' study will evaluate the desirability and practicability of governmentally operated or financed banks established for the purpose of extending long

term credit at selective rates of interest.

Also concerned with the topic of international economic relations is Professor John Day Larkin, Chairman of the Department of Political and Social Science, whose research interests are in problems of legislation, and particularly in government regulation of economic affairs. Before he joined the faculty of the Institute, he had published studies dealing with the President's control of the tariff, and with reciprocal trade agreements. Free trade among nations was prevalent during most of the period when the so-called "industrial revolution" brought into being our modern economic society. In recent years, however, nations have erected higher and higher tariff barriers to interfere with the flow of trade. Professor Larkin's first study dealt with the so-called "flexible tariff" which permitted the President to raise rates when an industry was confronted with vigorous foreign competition, his second study with the present Administration's trade agreements program which represents an attempt to restore some measure of international trade through agreements among nations.

In the past few years Professor Larkin has given principal attention to government regulation of labor relations, primarily from the standpoint of public law. His current responsibilities as a mediator in labor disputes, and as Acting Vice-Chairman of the Regional War Labor Board present him with a complex task of negotiation, administration, and applied research. Arbitration under modern conditions has become a highly technical research function, requiring a careful fact-gathering survey to determine prevailing wage rates and employment policies, together with an analysis of applicable statutes and administrative regulations.




Source: Based on data from *Technological Trends and National Policy*, National Resources Committee, 1937, table 8, page 77, for all industries except agriculture. For the data on unit labor requirement in agriculture, see appendix 18, section 10.

## TECHNOLOGICAL CHANGE AND SOCIAL CHANGE

**Invention and industrial progress reduce the number of man-hours required to produce each unit of goods. The social scientist seeks to design social institutions which will facilitate this progress and turn the saved manpower into socially useful channels—avoiding "technological" unemployment.**

Defects in the investment capital market have been cited above as an example of a social barrier to technological progress. All such social barriers to the use of the new methods and new products developed by engineering research limit the usefulness and scope of technical research and the opportunities of engineers to practice their profession. The American economy contains many such barriers at present, and their number is growing at an alarmingly rapid rate. Professor Yale Brozen is studying the controls and restrictions on technological change with the aim of devising methods of social and economic organization which will permit full use of technological innovations without incurring the opposition of the special interest groups who have sponsored the erection of barriers to technological change in the past.

A second research interest of Professor Brozen lies on the borderline between economic science and ethics. The region of overlap between economics and the moral sciences has grown to include such large portions of both fields that many persons who ordinarily could not pretend to be anything but moralists are lifting their voices as economic experts advocating programs of action whose only recommendation is the humanity of the ends which such programs are supposed to achieve. The resulting confusion between means and ends, and advocacy of inefficient means because of the good ends supposedly served by the means in question, has created an acute need for a systematization of economic theory which, by clarifying the issues, would eliminate at least some of the confusion and the resulting strife. Professor Brozen is currently engaged in constructing a systematization with this view in mind.

Research of the kind just described is concerned with the broad structure of modern economic society. When that society is examined in greater detail, it can be seen that it is really a mosaic made up of tens of thousands of individual pieces, each one of them a separate business organization or firm. It is in these individual organizations that the actual engineering

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# WOOD IN WAR AND PEACE

By
C. J. HOGUE

Wood occupies a peculiar position. It comes near to being the most universally useful material we have, yet it's so much all around us, so readily available, we're so familiar with it, that we take it as a matter of course.

When we want to build something temporary, or something cheap, we use wood. It's easy to get; anybody can work it, and everybody knows how to use it—or thinks he does. If we don't take care of a wood structure, or use a temporary one too long, and it becomes unsafe—that's just wood.

We take care of expensive material, and materials that are hard to get or hard to work. We keep them painted and keep them up. If they fail, we look for someone to blame for not taking care of them. If wood fails—that's just wood.

Everybody likes wood, and everybody loves a forest. Even the man who opposes most vigorously the use of wood in the new schoolhouse, or the new bridge, may have a complete wood-working outfit in his basement and spend a lot of spare time there.

It isn't that we're prejudiced against wood — it's just that we're too familiar with it to take it seriously. It's largely the lumberman's fault that this is so. He has been too busy making lumber to realize that he needed to sell it. So long as there were frontiers, the lumberman was a public benefactor. He pioneered the way and made the lumber for the settler to build with. He has had competition for so short a proportion of the life of the lumber industry that he hasn't realized the need to sell—




A Signal Corps Replacement Center.
Typical war construction in wood.



Laying Douglas fir decking on an auxiliary aircraft carrier.

to sell the material, and the why and the how to use it. And so we don't take it as seriously as its merit and importance deserve—for it is important, in every-day life as well as in an emergency.

Lumber is the first material turned to in an emergency. It was the first material turned to in our present emergency. We couldn't produce enough in 1940, nor in '41, nor in '42, and we won't be able to in 1943. We have the forests, we have the mills, but we can't get enough men.

The character of the war requirements has changed from time to time. First it was camps, cantonments and air stations; then pontoon bridges and shipbuilding plants and ship tenders, and ship decking; and structural timbers and more structural timbers; then aircraft material and more aircraft material, and aircraft hangars till we come to the biggest things ever built of wood—the dirigible hangars that cover seven acres, a thousand feet long, and as high as a sixteen-story building.

Then wood ships, landing barges, mine sweepers, patrol boats, and those marvelous sub-chasers and mosquito boats that go as fast as the fastest train. Now boxing and crating lumber for overseas shipment that is taking half of the whole of this year's lumber production, and big timbers for overseas for landing docks and drydocks, and still aircraft, and ship decking, and pontoon-bridge lumber, and always housing and more housing for war workers.

Aircraft parts, bodies, propellers, mosquito bombers, training planes, gliders, hangars and shops; ammunition dumps; boxing and crating; cantonments, huts, bunks, cots and tables; charcoal for gas masks; cribbed bridge-piers and temporary bridges; decoy guns and decoy planes; grain bins; gun stocks; housing and more housing; industrial plants; piling; pontoon bridges; ships and ship building plants, aircraft crash-boats, barges, Coast Guard patrol boats, mine sweepers, mosquito boats, PT boats, sub-chasers, ship decking; skis for ski-troopers; ties for overseas railroads; towers — water towers and lookout towers; truck bodies; warehouses.

Major General Reybold, Chief of Engineers, United States Army, wrote, in the June, 1943, *Timberman:*

> Despite everything we have been able to do in an effort to make the task of the lumbermen easier in the present crisis and under existing conditions, the lumber industry is unable to compete with other war industries in many particulars. Such industries are able to pay higher wages with easier working and living conditions; they offer, too, a greater amount of over-time work with over-time pay. The result is that many of the lumbermen who were not conscripted have moved into the cities for factory work.
>
> With an accentuated demand for airplanes, and tanks, manufacturers had factories erected for them, they were given priorities and material, men and equipment, and the Government guaranteed them against

losses. None of these things was done for the lumber industry. Few special deferment privileges went to the lumber worker. The equipment with which the lumber producer went into the crisis must still be used, although under normal circumstances much of it would have been replaced in part, or in whole, long before this. The business risks he takes are purely his own; the worrying man-power problem—at least until the WMC freeze —was one with which the lumber industry had to deal on its own.

Yet the lumber industry is expected to produce more lumber than ever before. The tradition of sturdy independence, resourcefulness, and downright tough stick-to-it-iveness, which has always characterized the woodsman and given birth to the not-so-legendary Paul Bunyan, has been magnified in the present emergency. The American lumberman has "delivered the woods!"

Wood was used in all ways, in almost every size and grade, and put together by almost every conceivable means.

In shipyards and docks, warehouses and industrial plants, it was used in the form of large sawed timbers. Preservative treatment, when required, was given to the extent of treating-plant capacity. Piling was creosoted where exposed to marine borers, but in many cases piling and timber exposed only to decay was used untreated. Fire-resistive treatment was given to the material of the blimp hangars.

Cantonments and housing projects were largely built in place but of course with assembly-line cutting and framing. A great many of the smaller shelter and storage buildings and huts were prefabricated and panelized. In some panelization the wall and roof surfaces were glued to light framing members, combining the strength of both. Many of the semicircular or parabolic shelters were framed with glued laminated ribs or rafters.

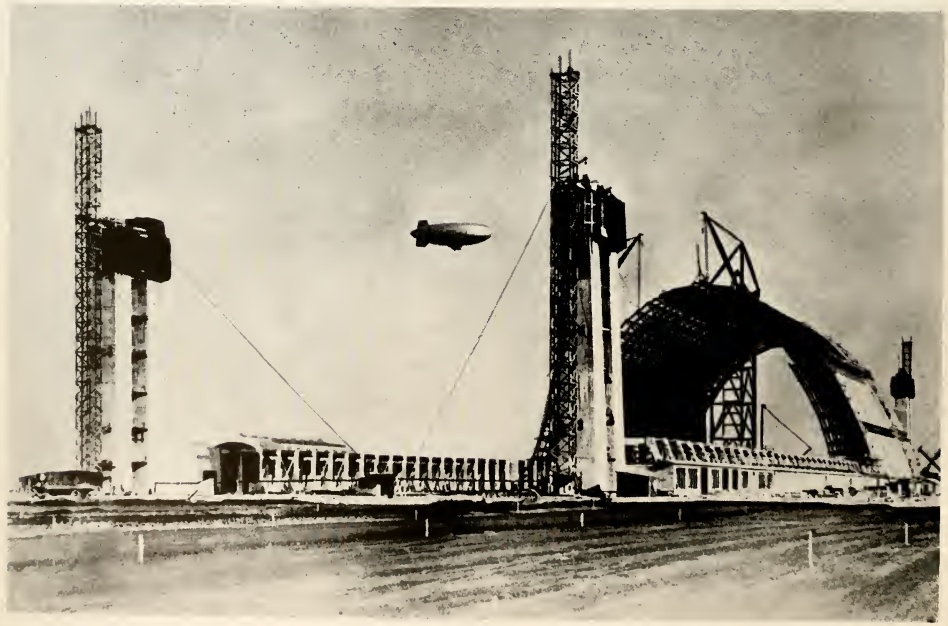
Roof trusses were framed mainly with TECO ring-connectors or shear-plates—with spans 130 feet or more in bowstring trusses, and 160 feet or more in flat-top trusses. TECO connectors were used extensively in other types of structures, including barges. Plate girders of lumber and plywood were framed with these connectors.

Glued laminated construction has been developed during the last few years and has been used extensively in the form of beams, arches and columns. It is very intriguing in its ability to make large members out of small sizes, of more or less random lengths, seasoned to permit gluing, the resultant member being largely free from shrinkage and checking, because made up of seasoned lumber.

Glued laminated beams and arches can be moulded to almost any desirable shape; cambered to assure against sag under load; built up on top to give pitch to a roof; curved to any desired shape and type of roofs. Such beams and arches are used in recreation rooms in housing projects; as chords in curved roof trusses; as arches in army chapels; as rectangular beams in warehouses and factories when it is impossible to get sawn timbers in the size required.

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One of the "biggest things ever built of wood."
A blimp hangar under construction.



# PSYCHOLOGY AND THE WAR EFFORT

By
DAVID P. BODER




*Photo Dept. of Visual Education*

**The lights on this board flash in groups at intervals of about a quarter of a second. The subject has to determine which of the lights flash together. Significant individual differences are found in this skill. It is a test involving hard and persistent work at a visual task.**

### Historical Introduction

When the United States entered World War One, it was found that enemies and allies alike had been using for some time the services of psychologists in problems of military organization.

Father Agostino Gemelly in Italy was devising methods for the selection of aviators. Dr. Carl Spearman in England was engaged in the construction of tests for the selection of personnel for the British Navy. The German psychologists, then not yet directly burdened by the task of finding a scientific justification for superman and racial diatribe, were contributing to the selection of specialized military personnel more than the allies would have liked them to.

With the first steps toward mobilization in 1917, American psychologists entered the picture.

The fundamental procedure of scientific psychologists in the promotion of the application of their science was always to begin with the status quo, and then, by gradually perfecting the existing procedures, change slowly and experimentally the entire picture in the direction of higher proficiency and greater smoothness.

The response to such an approach is usually one of fearful skepticism at the beginning which gradually transforms itself into a "how could we have done without it" attitude. This we may say in passing is a diametrically opposite picture to the case of the quack psychologist. The latter finds means to be accepted with great enthusiasm, but is soon made to disappear from the scene as quietly as possible in order to spare his sponsors some moments of bitter embarrassment.

The nature of psychology as a science is such that its product is not readily recognized by the layman. Unlike the engineer, the psychologist

does not produce material objects which can be judged by the consumer. The products of scientific psychology reveal themselves in improved human relations, improved interactions between man and man, or between man on the one side and tools, machines, and phenomena of nature on the other. This improvement is often not observable unless statistical methods of analysis are used, and unless there is an honest endeavor to strive toward such improvements.

It is for this reason that American psychologists have clustered around the American Psychological Association, a body of scientists which counts among its members nearly all academic and applied psychologists from the days of William James and Stanley Hall.

It was this body of academic psychologists which was chosen as spokesman for American psychology in 1917, and it was due to this unselfish and democratic procedure that within two years an almost unimaginable task was accomplished. The procedures devised practically anew by American psychologists, after the acceptance of their cooperation by the armed forces, have become the foundation of most procedures for psychological measurement and selection not only in this country but the world over.

What were the fundamental characteristics of American military psychology? We could answer this query as follows: mass production, and mass production of good quality. Instead of limiting themselves to the screening out of the few feebleminded or mentally retarded, or those tainted with special defects which would render them unfit for certain duties, such as flying or navigation, American psychologists embarked upon the search for practicable methods to cover the whole contingent of men called into service. Their aim was to accomplish not only the screening out of the unfit, but to spot where possible the most fit for a given branch or level of military activity. They were out to find not only those *unfit* to be soldiers, but also those *best fit* to become officers.

By the time of the armistice in 1918, the files of the Psychological Division showed that more than 1,700,000 men had been given the army psychological tests. This material also revealed that nearly one-third of this group were unable to "understand newspapers or to write a letter home," and that nearly half of these "practically illiterates" were American born. In other words one-third of the men drafted in 1917-18 were unable to follow printed instructions that come with the various food or tool kits, or are printed on safety devices, chemicals or ordnance material, not to speak of road maps or folders of rules and regulations. The impact of these findings upon subsequent educational trends was greater than people outside of the circles of educators or educational sociologists usually realize.

But as we stated before, the army psychologists of 1917-18 did not limit the scope of their work to the important task of screening out the unfit. The army test program was one of the greatest experiments aimed at establishing individual differences within the normal population in the field of mental alertness, or so called "general intelligence."

### Between Two Wars

Once the war was over, most of the military psychologists returned to their class-rooms and research laboratories at the universities and colleges all over the country. Military pursuits were pressed into the background. However, the literature indicates that the procedures developed by the military psychologists were not entirely abandoned by the armed forces.

At that time, with the army experience at hand, a number of psychologists turned their interest to industry. But except with some few of the largest industrial units, such as the telephone companies, Western Electric, some taxi-cab companies, and some advertising firms, the psychologists found but little acceptance.

One of the reasons for the slow acceptance of psychological methods by industry was the lack of psychological training on the part of the engineers and industrial managers; another was the lack of technical experience on the part of the psychologists. Moreover, as in the case of the army, the work of the psychologist in industry had to start with extensive research. The psychologist can rarely enter an industry with his procedures ready. In most cases he has to make a survey of the nature of the work in a particular plant, must determine the general and specific abilities involved in the manufacture of each particular item, must establish the special sensory and motor capacities required in the performance of a particular task, and then must find or design the tests required to select the proper personnel. The psychologist also aims to explore to some extent the phenomena of industrial fatigue, and to survey the factors which account for morale, absenteeism or unrest. But all these activities require research, and only the big industrial plants considered themselves able to provide the means for such extensive studies. Just as the individual farmer can not afford to embark upon agricultural research and broad agricultural experimentation, so are most of the industries unable to carry the financial burden connected with research in industrial psychology. The situation is however more unfavorable for industrial psychology than for agricultural research. A large agricultural college, with subsidies from the federal or state government, can run its own experimental farm, often on a rather large scale, but so far no university has seen its way clear to run an experimental plant which would provide facilities for psychological research. To fill this gap, the federal employment services have recently done a great deal of research in psychological job analysis and construction of industrial tests. At least in Chicago, some industries have wholeheartedly cooperated with the psychological division of the social security office. One of their outstanding psychologists was Dr. S. Evans, who until his transfer as psychologist for the War Department, was on the evening school staff of I.I.T.

### Psychological Work of the Enemy

We now are ready to turn to present day problems of psychology in connection with the war effort.

It seems that the reader will gain a better insight into the task of American psychologists if we devote a few paragraphs to the use of applied psychology by the enemy.[1]

The treaty of Versailles had reduced the Germany army to 100,000 men of whom only 4,000 were to be commissioned officers. Moreover, it was stipulated that no more than a 5 percent turnover should take place annually. This was apparently to prevent a military training program under which individuals, after a year or two of intensive military training, could be placed on the reserve list and new men enlisted. In spite of the broad program of democratization of the country undertaken by the Weimar Republic, little if any of the new political trends touched the organization and the spirit of the army, which remained under the domination of the Junkers. The definite political character of this domination revealed itself as early as 1922 when high army officials made themselves so conspicuous in the Nazi beer hall putsch.

Around the late twenties, the Reichswehr embarked upon a definite plan

[1]See Ladislav Farago (Editor), *German Psychological Warfare,* Putnam's Sons, N. Y., 1942.

of reconstruction of the German Army. Not ready yet to violate openly the numerical restrictions of the Versailles treaty, the Junkers apparently decided to attract into the army, a contingent of men mentally well equipped to form a skeleton army capable in the shortest time to expand into an army fit for any new aggressive adventure.

It was around that time (1927) that a retired colonel, Hans von Voss, was able to convince the higher command of the Reichswehr of the immense value of psychological methods of selection. A new institute of military psychology was founded and Voss was appointed "commander" of the institute, while Dr. Simoneit became its scientific director and intermediary between the army and the university psychologists. At the beginning, the scope of the institute was limited to the development of methods for the selection of officers and specialized personnel such as fliers, tank drivers, etc. The selection of officers was especially difficult since the population from which the officers could be chosen was greatly restricted. This was due to the insistence of the Junkers that the officer-personnel be drawn exclusively from the families of their caste.

Since that time, an enormous scientific and pseudo-scientific psychological literature has appeared in Germany. A list of the main topics of German military psychology includes the problems of military organization in terms of selection and functions of personnel, adaptation to equipment, indoctrination, propaganda, and finally actual conduct of the war. Fortunately, the broad scope of the work was not amenable to great secrecy. The procedures and methods were broadly discussed in psychological as well as military periodicals.

### American Psychologists and the War[2]

When, in June of 1941, the Emergency Committee in Psychology, appointed by the National Research Council, published a comprehensive summary and bibliography of *Military Psychology,* it became clear that information concerning German methods of military psychology, at least in a broad sense, was not inaccessible to American psychologists. But as the committee states: "We are supposed to be a peace-loving people. It may therefore be assumed that most of the American psychologists have pursued their professional activities against a background nearly empty of any concern about war." However, it was this abundance of scientific experience acquired during intensive and unhampered research on problems of peaceful pursuits, the experience in classification of college and high school students, the experience in testing and placement of the unemployed, the methods devised by industrial psychology and by psychologists engaged in vocational guidance and counseling, and the immense quantity of "pure" scientific research done by professors and students of American universities, that made it possible for American psychology, like American industry, to find the necessary, competent personnel, and to retool, so to speak, at a rapid pace, being definitely aware "that it is later than we think."

One of the fundamental characteristics of the psychological work in the armed forces lies in the emphasis upon the study and classification of the *normal* population of the Army. To be sure, psychologists at induction centers are instrumental in discovering the feeble-minded and retarded, and work hand in hand with the psychiatrists in discovering the neurotics. These activities, however, are far overshadowed by work toward the classification and selection of men for the various specialized branches and levels of military activity. As an example, we may refer to the work of the "Classification and Enlisted Replacement Branch of the Adjutant General's Office." This branch, headed by Col. George R. Evans, has at its disposal an advisory committee of seven psychologists under the chairmanship of Dr. Walter V. Bingham, one time professor of industrial psychology at Stevens College, and director of the Personnel Research Foundation (1924-35). This section is headed by a psychologist, Major (Dr.) M. W. Richardson (formerly of Chicago). It was this division which constructed the Army General Classification Tests, the tests for clerical and for mechanical aptitudes, and the tests for radio operators. According to reports available, close cooperation is maintained between this division of the Adjutant General's Office and the other offices of the armed forces engaged in personnel work.

However, the work of psychologists does not end with testing at induction centers. We have before us an article by Lieut. Commander John G. Jenkins A-V(S), USNR,[3] formerly head of the department of psychology of the University of Maryland. The facts it gives are of June, 1942. Applicants at Naval Aviation Cadet selection boards were given "psychological tests which are designed to screen off those applicants least resembling previously successful cadets . . . One or more psychologists are assigned to each of the several Naval Reserve air bases to which the cadets go for the first third of their flight training . . . Psychologists are also available at stations to which cadets go for advanced and operational training."

The fundamental effort of the psychologists at the advanced stages of military training lies in the procedure for "testing the tests" or as it is often called, the follow-up procedure. By March, 1942, test records were available on 16,000 aviation cadets, together with biographical data, and performance data in training and in subsequent service. The validity of the tests was then established by check against success in training and post training performance. Writes Dr. Jenkins: "As rapidly as combat data can be secured—and this cannot be very rapidly— all of the tests will be run against performance under fire."

What are the implications of such a procedure? In brief, they may be formulated as follows: Not only shall we have an Army of highest efficiency in the field, but all men and women accepted in the service will be assigned to duties for which they are most fit. This will help them learn their duties with the least amount of apprehension and frustration, and will give them, in the long run, the best chance of survival in combat. It has been repeatedly said that our fighting forces endeavor not only to train men who will be most efficient in combat, but also to select and to prepare each and everyone of them for a task in which he will be most capable of striking his blows at the enemy with least hazard to himself and to his fellow-fighters. A pilot mentally or temperamentally unfit for his task may cause not only great material loss but may wantonly sacrifice his life and the lives of his buddies before ever reaching the battlefield.

### The Psychology Laboratory at I.I.T.

For the last three years, the work at the I.I.T. psychology laboratories has been directed as far as possible toward the war effort. In the absence of graduate students in the division of psychology, research is necessarily bound to remain within modest limits. However, with organization of the Army Signal Corps training courses at I.I.T. under the direction of Pro-

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[2]Our statements referring to American military psychology are based upon reports in the official organ of the American Psychological Association, the *Psychological Bulletin.*

[3]Jenkins, John G., *Utilization of Psychologists in the United States Navy,* Psychological Bulletin No. 39, June, 1942.

# CHANGES IN SHOP COURSES FOR ENGINEERING STUDENTS AT ILLINOIS INSTITUTE OF TECHNOLOGY

By
J. S. KOZACKA

In 1934, a committee was appointed at Armour Institute of Technology to study the problem of shop courses for our engineering students. The committee comprised representatives of five departments of engineering with the following membership: J. B. Finnegan, Chairman; E. H. Freeman; H. T. Heald; P. C. Huntley, Vice Chairman; C. A. Tibbals, Secretary.

The committee went to work immediately and decided to use the questionnaire method of study, asking the deans of engineering colleges, Armour alumni, employers of engineers, and faculty members of our departments at Armour for expression of opinion. As a result of this study, the committee published its findings in March 1935, and made the following recommendations:

> . . . The committee is definitely of the opinion that shop courses should be included as required subjects for students in mechanical, electrical, chemical and fire protection engineering, and that shop courses should be listed as elective subjects for students in civil engineering and in science.
>
> The committee defines the objectives of shop courses as follows:
>
> The development of knowledge of shop machines and processes.
>
> The development of knowledge of the properties of materials used in shop practices.
>
> The development of knowledge of the fundamentals of shop economics and management.
>
> In the opinion of the committee, shop courses should be directed by a properly qualified engineer who is competent to establish proper coordination within the shop program, and maintain necessary correlation with other subjects included in the curriculum. . .

One may properly ask what progress has been made in changing shop courses, so that the objectives set by the committee may be achieved? The answer is that so far many changes have been made, some are being made, and more will be made as soon as proper equipment is available.

Changes were made when Prof. P. C. Huntley was the head of the Mechanical Engineering Department, with Dr. W. A. Pearl in charge of shops. These two men instituted changes in the course material, keeping in mind the objectives set up by the committee. Even greater changes took place when Professor J. I. Yellott assumed the directorship of the Mechanical Engineering Department, and Professor J. S. Kozacka was transferred from Lewis Institute, and took over the task of looking after the shops when Dr. Pearl resigned.

The shop courses at the present time are: M.E. 318, Cast Metals Laboratory; M.E. 319, Machine Tools Laboratory; M.E. 418, Metal Processes Laboratory, and M.E. 419, Production Methods Laboratory. Engineering Materials, M.E. 230, was added to round out the Metal Processing and Metal Technology courses.[1] The work of the students in these courses at the present time is as stated in the following paragraphs.

In M.E. 318, Cast Metals Laboratory, the student performs nine or ten molding jobs, which include bench, floor, and machine molding. These are just enough to acquaint him with molding operations and difficulties. On the other hand he performs ten to twelve experiments on: transverse strength of cast iron; hardness of cast iron; growth of common cast iron when subjected to higher temperatures; tests of molding sand for moisture, size, percent of clay content, permeability, and compressive strength. Tests are also made on cores to determine permeability and transverse strength. The student makes job analyses of molding operations, and does time and motion studies of molding jobs using loose and mounted patterns. He also learns how metal is charged into the cupola or into a crucible. In the lectures which are correlated with his laboratory work, he learns of the specifications for foundry materials, methods of melting and heat treating, the metallurgy of cast metals, the benefits that can be derived from alloys, and methods of testing of cast metals. He also learns of the properties of cast metals that are of importance to the engineer, methods of computing furnace charges on the basis of chemical composition, and pertinent facts about the design of castings.

New equipment has been added to the foundry laboratory to facilitate students' work, and the principal items purchased are: sand testing equipment, Ro-Tap machine, a 24-inch mechanical sand mixer, a recirculating automatic-control core oven, gas furnace for melting non-ferrous metals, squeeze-type molding machine, stripping-type machine, and transverse-testing machine.

Other equipment which should be added in order to interest advanced day and evening students in foundry materials control are: sintering tester, flowability tester, dilatometer, apparatus for chemical analysis of metals, hydraulic and pneumatic power mold-

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1. Shop courses are now required subjects in the Mechanical Engineering and Electrical Engineering curricula, elective in several other curricula.

# BETTER MOUSETRAPS

By
FRANCIS GODWIN

Through these war years there is quietly coming into existence a radical method of industrial heating, based upon the use of high frequency electric currents. Comparatively little is heard of this expanding development, as its application is now confined chiefly to very necessary war production processes. Since 1941 the Armour Research Foundation has had under way an intensive program of laboratory investigation on this interesting application of electronics, and while the effects have already been felt in war industries, some revolutionary post-war possibilities are becoming apparent.

In reality, advances are being made in two distinct forms of high frequency heating. The first of these, operating on the induction principal, is suitable for the heating of electrically conducting materials. For non-conducting materials an electrostatic method is used. Oddly enough, both systems have actually been in use for years, the first being the basis of the fairly common electric induction melting furnace while the second is recognized in the well-known "artificial fever" of medical practice.

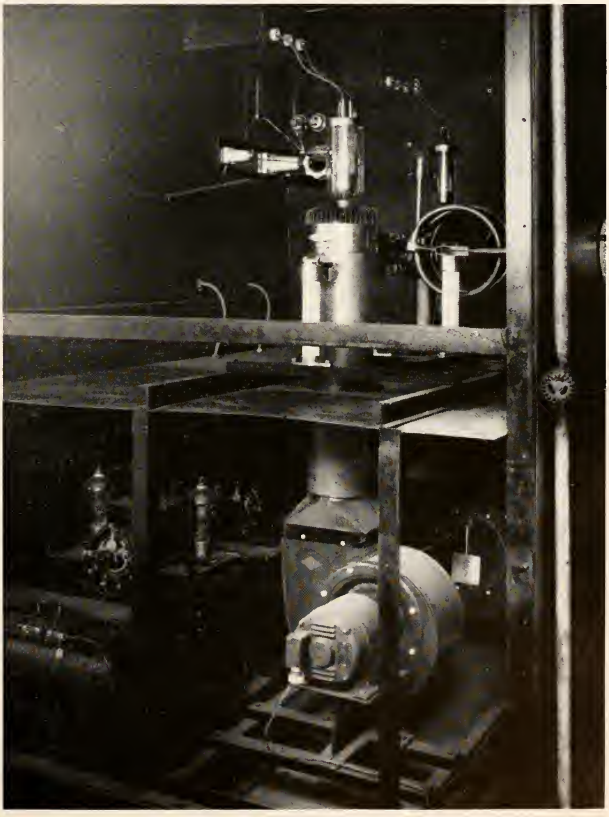
In the induction process, high frequency currents pass through what is in effect the primary coil of a transformer, the secondary being represented by the conductive material being heated. The heat itself is the result of eddy currents in the material. The phenomenon not only can achieve complete melting for such applications as alloying and foundry work, but also permits local heating near the surface of a material. As an example of the latter, the process can be used for close control in various types of surface or "case" hardening of steels, in which the depth of hardening is regulated through variation of the frequency input.

Significantly at this time, induction heating has entered into the large-scale manufacture of tinplate, with a substantial saving in the amount of critical metallic tin consumed. In a procedure developed in its various phases by Inland Steel Company, Westinghouse, and the Armour Research Foundation, the tin is first deposited electrolytically on the steel surfaces, producing a coating with a matte surface but requiring only about a third the amount of tin formerly used in the older hot-dip process. This initial matte surface needs further treatment, since it lacks the necessary brightness and continuity and the desired alloying bond with the steel base. Therefore the coated strip is next passed through a set of coils connected to a high-frequency unit. Eddy currents thus induced cause the tin surface to flow momentarily; immediately afterward it cools and hardens into a bright, non-porous, corrosion-resistant coating. Since the fusion is accomplished by induced currents, there is no physical contact with the molten metal to disfigure its continuous surface.

For the heating of non-conductors, short-wave heating methods promise applications even more striking. Here

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Interior of an experimental 15KW high frequency oscillator operating at 3 megacycles.



# OBITUARY

## ALFRED L. EUSTICE

Friends and associates everywhere were shocked by the sudden death on April 30, 1943, of Alfred L. Eustice, President of the Economy Fuse & Manufacturing Co. and a member of the Board of Trustees of the Illinois Institute of Technology.

Born in East Dubuque, Illinois, in 1884, he spent his youth in nearby Galena where the pioneer stories of his father's illustrious neighbor, Ulysses S. Grant, became part of his life. He attended the Galena High School and later enrolled in the Armour Institute of Technology, from which he was graduated in 1907.

Endowed with a love for mechanical research inherited from his father, he soon revealed his enthusiastic interest and resourcefulness in a technical environment. Shortly after leaving Armour Institute he recognized the importance and the greater need of safety requirements in the transmission of electric current, which resulted in his invention and development of the "drop out" renewal link which made possible the renewable type of cartridge and plug fuse. This type of fuse is now in use throughout the world.

All this led to his being selected as a member of the "Modern Pioneers" by the National Association of Manufacturers. In 1940 his Alma Mater conferred upon him the honorary degree of Doctor of Engineering for outstanding developments and achievements in the field of electrical engineering and manufacturing.

Mr. Eustice recognized the need of engineering education in the Chicago area, and he was therefore an ardent supporter of the Armour Institute, and more recently, the Illinois Institute of Technology—being secretary of the Board of Trustees, a member of the Executive Commitee, and a director of the Armour Research Foundation. His sincere interest in the welfare of the Institute is attested by the fact that he attended the Alumni Association Drive Banquet on the evening of his death.

As President of the Economy Fuse & Manufacturing Co., he enjoyed the respect and confidence of his many employees, many of whom had been with him for more than twenty-five years. Himself a tireless worker, he imbued his fellow workers with a stubborn singleness of purpose—a job well done. A monument of gratitude rests in the minds of a host of employees who were recipients of his personal attention or advice at times when distress seemed overwhelming. It was all in a day's work and he hoped for nothing in return but loyalty.

Mr. Eustice found diversion from the burdens of business on his Barrington Hills Farm where his saddle horses and the wild-bird refuge were his recreation. Through his guidance and inspiration, his wild-bird sanctuary enjoyed state and federal recognition and was gaining national prominence.

His benevolence to his fellowmen was hidden under a cloak of silence and few knew what pleasure it gave him to help the unfortunate.

His achievements are milestones and an inspiration to those who were so fortunate to be associated with him.

C. A. Herbst.

## C. W. HILLS, JR.

Charles W. Hills, Jr., a trustee of Illinois Institute of Technology, and formerly president of the board of trustees of the Armour Research Foundation, died September 19 at his home, 930 Rosemary Road, Lake Forest at the age of fifty-five.

Mr. Hills was chairman of the finance committee of the Houdaille-Hershey Corporation of Detroit, and a director in several automobile and engineering companies. He was a prominent patent attorney and was especially active and interested in the affairs of the Institute.

Mr. Hills was born in Shelby, Michigan. He attended University High School, Armour Institute of Technology, and Kent College of Law, beginning his law practice in Chicago with the law firm of his father.

He was a member of the Union League, University, Attic, and Exmoor Country Clubs, and the Detroit Athletic Club. He maintained offices in Chicago and in Washington. He is survived by his widow, the former Eleanor Diamond, and by his father, C. W. Hills, Sr., of Miami, Florida.

## C. PAUL PARKER

C. Paul Parker, M.E. '10, member of the Board of Trustees of the Illinois Institute of Technology, died June 18 at the Evanston, Illinois, hospital. His death was caused by a cerebral infection.

Mr. Parker was a patent lawyer associated with the firm of Parker, Carlson, Pitzner & Hubbard in Chicago. He had been with the firm since he was admitted to the Illinois bar in 1913.

He had been a trustee of Illinois Tech for nearly a decade; he was also secretary of the Armour Research Foundation.

Mr. Parker was born March 30, 1889, in Elmwood, Nebraska, and came to Chicago when he was eighteen. He attended Lewis Institute, Northwestern University, and the Kent College of Law.

Mr. Parker was a member of the Chicago Athletic Association, the American Bar Association, the American and Chicago Patent Law Associations, Delta Theta Phi law fraternity, the Republican Club and the Glenview Club.

He is survived by his wife, two daughters, a sister and one grandchild.

# HELP! HELP! HELP!

## FROM OUR ALUMNI TO OUR ALUMNI

By
JOHN J. SCHOMMER

Many requests have come to this office for information regarding the procedure for changing to jobs offering more pay or involving more responsibility, to positions where the climate is better for either wife or alumnus, or to jobs which are desirable for other reasons. These requests have been occasioned by the recent regulations imposed on the workers and industries of the United States by the War Manpower Commission in an effort to promote an employment stabilization program.

Under no circumstance quit your job unless you first procure from your employer a form properly signed. This certificate, signed by your employer, is called a "Statement of Availability," a "Transfer Slip," or a "Release." If you do not have this form, properly signed, you must wait thirty days after leaving your present job before accepting a new one. You must also inform your local draft board that you have quit your job. In that thirty-day interim you will feel the hot breath of your draft board on the back of your neck. They may catch you for Uncle Sam's Army rather than for Uncle Sam's production plants, where you engineers belong. That thirty-day interim undoubtedly will be increased to sixty days before long. So if, from thirty to sixty days, you are out of the jurisdiction of an employer who needs you and who will fight for you because of your training and experience as an engineer, you are going to be in the armed services.

If your employer will not give you a release, then go to the United States Employment Office nearest your employer's business and obtain the "Statement of Availability." If you cannot find this office, go to the nearest post office and secure the necessary address. At the United States Employment Office you will find an interviewer and to him you will explain your reasons for wishing a change of job. The United States Employment Office can override your employer's refusal to let you leave his employ.

If you are leaving the locality in which your United States Employment Office has jurisdiction, you must obtain clearance papers from your present office before you can locate in a new one.

Acquaint yourself with the regulations governing your locality. These regulations differ in the various regional districts.

The regulations for Region VI, comprising *Chicago, Peoria-Quincy, Muncie, Marion, Richmond,* and *Racine,* are as follows:

### Rights of Workers to Transfer

1. Any employee, who during the preceding thirty days was engaged in an essential activity, may transfer to another essential activity without restriction provided the transfer does not involve a higher wage rate or salary scale than that received in his last employment.
2. Any employee, who during the preceding thirty days was engaged in an essential activity, may transfer to another essential activity without regard to wage rate or salary scale upon the presentation of a statement of availability issued in accordance with the provisions of this Regulation.
3. Any in-migrant employee may apply to the United States Employment Service of the War Manpower Commission in the area in which he wishes to be employed for a statement of availability for employment in that area.
4. Any employee, who during the preceding thirty days was engaged in an essential activity, may transfer to an unclassified activity without restriction provided he does not receive a higher wage rate or salary scale than that received in his last employment.
5. Any employee, who during the preceding thirty days was engaged in an unclassified activity, may transfer to an essential activity without restriction and without regard to wage rate or salary scale.
6. Any employee, who during the preceding thirty days was engaged in an unclassified activity, may transfer to another unclassified activity without restriction and without regard to wage rate or salary scale.
7. An agricultural worker may transfer from one farm employer to another farm employer without restriction and without regard to wage rate or salary scale.

### Methods of Transfer

Statements that workers are available for work in essential activities will be issued when a change of employment will aid in the effective prosecution of the war. A worker who is granted such statement may seek employment with any essential employer and may be hired by him.

A. An essential worker is entitled to a statement from his employer that he is available for work in an essential activity whenever the worker:
   1. is discharged by his last employer,
   2. is laid off for an indefinite period, or for a period of seven or more days,
   3. can establish that his present employment does not utilize him at his highest skill, or that

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# THE BOOK SHELF

*War as a Social Institution,* by Jesse D. Clarkson and Thomas C. Cochran, Columbia University Press. 1941.

This is a collection of excellent essays edited for the American Historical Association, setting forth the historian's perspective. Twenty-six scholars approach the subject of war from five different positions, namely, (1) the roots of war, (2) its strategy and tactics, (3) its effect upon the concept of neutrality, (4) its larger influence on social institutions, and (5) the implications of the present war for the United States of America. The subject of war is treated by these collaborators in terms of psychology, geography, economics, public finance, politics, and history. The reader thus obtains a broad perspective and cross sectional understanding of war as a social institution.

The section dealing with the roots of war is especially significant. We are reminded that the United States itself was born of war. After the Civil War and after the era of the Bismarckian wars, war began to recede from its dominant place in historiography. The study of war was regarded more and more as reserved for students of diplomacy or military historians, among whom a few asserted some of war's institutional aspects.

Since 1914 war has asserted itself anew. The place of war as a social institution was not seriously challenged, armaments increased, and the subterranean struggle to preserve national advantages led directly to the desperate resort to totalitarianism. And the quarter century of experience with European war, revolution and depression, profoundly altered social and professional attitudes alike. In the United States the frontier was gone; the horizon seemed no more. Life seemed to be getting too involved for the people in general.

In this study the causes of wars are seriously considered. The writers are asking whether war is the necessary result of combative tendencies present in all human beings, or whether wars inevitably follow advanced technological and complex social organization. If war is neither sociologically necessary nor economically desirable, it should be possible to control it by international agreement.

The opening essay by Kimball Young is most timely and suggestive. The principle of "blocked tendencies and interests" on the part of individuals as well as nations gives room for much thought. These "blockings" leave residues of anxiety, uncertainty and conflict appearing again in later developments. The question may then be asked, Why do human beings fight? Not because they are biologically impelled but primarily because they are culturally induced to do so. In this regard the evil of modern totalitarianism is diametrically opposed to and completely incompatible with the constitution of human societies for the normal, peaceful business of producing, maintaining and reinforcing wealth, solidarity, reason and conscience, all of which are the real indices and values of human culture.

The economic base of national life is well treated in essays on "National Wealth and Protection Costs" and "Do Colonies Pay." Likewise the role of the peace of Versailles is discussed most satisfactorily in three excellent essays setting forth the French, Italian and German opinions.

The technical aspects of war, the strategy and conduct of modern warfare, have received very little attention at the hands of accredited historians. In this collection of essays the geography and role of transportation, especially railway, in relation to military strategy are presented in two studies.

The civilian as well as the military elements in modern wars are now very important. With the development of railways, internal combustion engines, and communication equipment, as well as with the perfection of metallurgical and scientific advances, the fundamental interdependence of military and civilian elements has vastly increased. The methods of warfare have had to be changed to meet the changing scene of action. In this respect the gathering and training of necessary man-power through conscription has also taken on a new aspect in these times. It may be asked, What of the status of neutrals in modern warfare? Two excellent essays present this issue, considering Finland, Denmark and Norway as cases in point. Modern war, war between great powers is global; its effect on society tends to be totalitarian. In the twentieth century neutrals have with belligerents a common interest in banishing this universal scourge.

An enlightening essay is entitled, "The Historian in Times of Trouble; the Age of the Renaissance." In an age of re-birth the historian is really essential as a leader of thought. He may approach the situation by stressing primarily the contemporary needs, or on the other hand he may complacently consider the past. Then again the historian may try honestly and courageously to discover the organic connection between the ideals of the past and the present. The historian struggles between participation *in* the historical process and detachment *from* it and this gives rise to serious difficulty. The historian can and must possess a knowledge of human institutions and a time sense. The element of change is always challenging. The forces of a society outmoded by the march of time either make way for new forces or the new will triumph in violence. Here lies the germ of revolutions.

The discussion of the "First World War and American Democracy" is a dynamic bit of thought and writing, and the response by Max Lerner is brilliant and thought provoking. Here is noted that war is no picnic, whether for America or any country. However, the war has shown the real stuff that democracy is made of. Democracy has shown that it can do the economic job of creating a war economy. It has shown that it is able to

create new administrative methods. Furthermore, it is good to know that a democracy can, at need, get a singleness of purpose in fighting for what is deemed worth while at the time. Democracy is revealed as capable of becoming a strong state without becoming a lawless state, and without surrendering its essential traditions and civil liberties and economic decency. The faith of and the faith in the common man are tremendous dynamic forces for the world prestige of democracy. And this prestige must be continually re-achieved. It will not and cannot be inherited.

War and modern dictatorship are well presented in a number of thoughtful essays. Whether dictatorships directly cause wars is questionable. But that the social, economic, and psychological crisis which follows a great war becomes the cradle of totalitarian systems of government is very probable.

The Japanese situation is dealt with in two essays. The role of American leadership in the non-totalitarian world is strikingly presented in a compelling essay written by Benjamin H. Williams. Concerning the United States, it must be observed that we are located in a very precocious center of civilization, and therefore subject to peculiar perils. This is revealed in the economic propelling forces arising from the superiority of American industry. The position of the United States among the nations of the world clearly confers a tremendous responsibility as well as far-reaching opportunities upon her. The advantages due to the location of the United States are numerous. First, the United States is not a frustrated nation. Again, the countries with which she is allied and must make her appeals are also not frustrated. Then too, the changes in the world balance of power indicate either an adherence to the doctrines of orthodox international law or the prospect of seeing nations shifting for themselves in combinations of states and nations arranged in opposition. The position of the United States in the precocious center of civilization is a most compelling consideration.

War is a social institution. How socially it proceeds depends upon the intelligence, skills and outlook of the people involved. Certainly some form of Association of Nations for mutual good is essential. For men and nations live and prosper in association with others.

An excellent index is included with this outstanding collection of essays. A bibliography would help the book very materially.

E. C. Paustian.

*The Chemical Technology of Petroleum,* by William A. Gruse and Donald R. Stevens. McGraw-Hill Book Company, Inc., 1942.

During the last decade we have witnessed spectacular developments in the petroleum industry. These developments were brought about by: (1) the necessity of utilizing waste products; (2) improvement of the existing motor fuels; and (3) the creation of new synthetic high, anti-knock fuels which could be used in the modern high compression engine.

The book of Gruse and Stevens presents a complete and modern picture of the science of petroleum in the light of these new developments. The book is divided into eighteen chapters:

Chapter I—Composition, Classification, and Description of Crude Petroleums
Chapter II—Chemical Composition of Petroleum
Chapter III—Group Reactions of Petro'eum Oils
Chapter IV—Physical Properties
Chapter V—Production Chemistry
Chapter VI—Origin of Petroleum
Chapter VII—Distillation
Chapter VIII—Refining by Chemical Methods
Chapter IX—Refining by Physical Methods
Chapter X—Cracking of Petroleum Oils
Chapter XI—Chemical Thermodynamics of Petroleum Hydrocarbons
Chapter XII—Gasoline and Other Motor Fuels
Chapter XIII—Kerosene
Chapter XIV—Lubrication and Petroleum Lubricants
Chapter XV—Paraffin, Amorphous Waxes and Petrolatum
Chapter XVI—Fuel Oils
Chapter XVII—Petroleum Asphalts
Chapter XVIII — Miscellaneous Petroleum Products and By-Products

There is also a valuable and useful appendix containing physical properties of hydrocarbons.

In Chapters II, III and XI on "Chemical Composition of Petroleum," "Group Reactions of Petroleum Oils," and "Chemical Thermodynamics of Petroleum Hydrocarbons," the reader will find valuable information on many of the new catalytic reactions of hydrocarbons, such as isomerization, alkylation, polymerization, aromatization, dehydrogenation.

Chapter X devoted to "Cracking of Petroleum Oils" gives a detailed and comprehensive picture of this important process including the discussion on the mechanism of this reaction.

Chapter IV on "Physical Properties" presents the latest information on x-ray diffraction, infra red and Raman absorption spectra, the valuable and useful UOP characterization factors, specific dispersion, Waterman's analysis, and other specific properties.

The book of Gruse and Stevens is of great value to any worker in the field of petroleum irrespective of his specialty and gives up to date treatment of this subject, so important to our national defense.

V. I. Komarewsky.

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*Industrial Fire Brigades Training Manual.* National Fire Protection Association, 60 Batterymarch Street, Boston, Mass. Single copies, $1.50 postpaid.

This 184-page volume, recently published by the National Fire Protection Association, is designed to meet three wide spread demands: first, as a training manual for employees assigned to carry out fire fighting duties under direction of the chief of the private brigade; second, as a reference book in those plants where a fire brigade is already organized, but where the experience of a large group of experts can be profitably utilized; and third, as a handbook in plants which need the essentials but not the details of large plant fire protection organization.

The book is divided into 16 chapters as follows: The Industrial Fire Brigade; Forcible Entry Practices; Rope Work; Fire Extinguisher Practices; Ladder Practices; Hose Practices; Salvage and Overhaul Practices; Fire Streams; Ventilation Practices; Periodic Inspections of Plant Fire Protection Equipment; Care of Fire Brigade Equipment; Fire Causes and Fire Hazards; Fire Fighting Procedure; Flammable Liquid and Gas Fires and Special Extinguishing Systems; Electrical Fires; Gas Masks and Rescue Practices.

The private brigade is probably the most important part of the fire safety organization. What to do when a fire occurs is what each member of the brigade must know before the emergency. The department heads must know that employees are organized to know how to prevent fires, how to use fire extinguishers, hand hose, and other first aid fire appliances. But it is up to the manager of the plant to arrange for the organization of a plant fire brigade.

The text was prepared by the N.F.P.A. Committee on Firemen's Training, a group of leading fire chiefs and fire protection experts. It is profusely illustrated with drawings and photographs.

# Bigger Round-ups

## AMERICAN BEEF . . . . . .





**A-C equipment** helps speed meat through packing plants—helps dehydrate foods so each ship can carry 10 times more.

**How Allis-Chalmers, one of U. S. A.'s most unusual companies, produ Tractors and Farm Machinery . . . Generators, Turbines, Drives for V Plants . . . 1600 products to help Feed the World and Lick the Axis.**

FEW OF OUR WORKERS have seen a Texas or an "Axis" round-up . . . yet they *are* helping to put beef on soldiers' plates, prisoners in Allied stockades.

They make the world's largest variety of *farm* and *war-industry* equipment . . . —Tractors, corn pickers, harvesters . . . equipment for dehydrating and processing foods . . . crushers for mi switchgear for steel mills; motors war plants . . . even hull sections for sh

And A-C engineers—in factories over America—are helping to incr production, not just with new mach —*but with machines already on hand.*

ALLIS-CHALMERS MFG. CO., MILWAUKEE,



ELECTRICAL EQUIPMENT



STEAM AND HYDRAULIC TURBINES



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CENTRIFUGA PUMPS




**ALLIS-CH**

**SUPPLYING THE WORLD'S LARGEST LI**

# or '43_

## AXIS BULLIES







(*above*) **A-C equipment** — motors, belts, drives—keeps all types of guns moving along U. S. production lines.

(*left*) **Huge A-C crushers** like this one munch iron ore, and other A-C equipment helps turn it into steel.

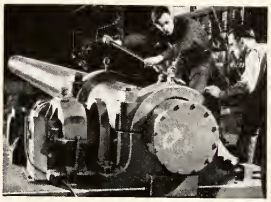

## VICTORY NEWS

**A-C Launches Farm Commando Plan:** A large share of America's farm equipment will soon be brought to peak efficiency through Allis-Chalmers' new "Farm Commando" program.

Two-day mechanic schools are being conducted by Allis-Chalmers men in many agricultural sections.

Designed to give untrained men basic maintenance "know-how," they also serve as "brush-up" schools for skilled mechanics.

Following this, the farmer receives detailed, specialized instruction on his own equipment. Special red-white-and-blue emblems are provided for his machines to announce that each of them is a "Farm Commando, Ready to Roll . . ."

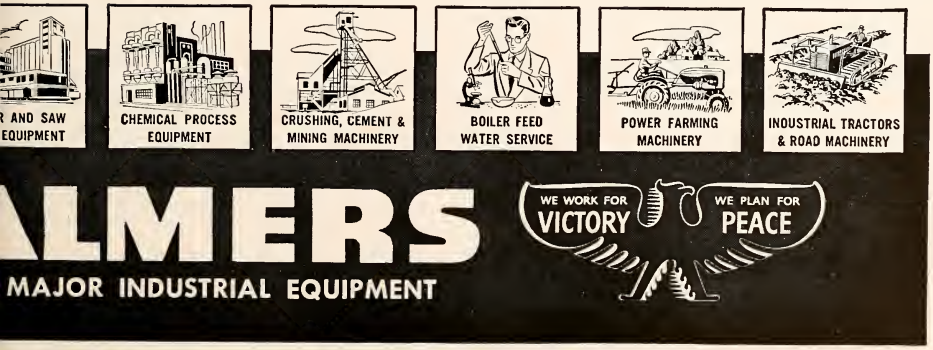



**Not A Gun,** but an Axis buster nevertheless! This huge tool is used in A-C shops to bore out the inside of kilns. It helps increase production of manganese.


**British Ask For A-C Booklet:** A sign that British industry currently cocks an eye at vital maintenance, comes in the form of a request from a representative of the Electrical Advisory Panel. To "tell all" about motor care in wartime, our Allies will pattern their information after Allis-Chalmers' "Guide to Wartime Care of Electric Motors." This booklet has already been widely distributed in the U.S.A. *Write for your free copy today.*



**FOR VICTORY**
**Buy United States War Bonds**

# FROM YEAR TO YEAR

## A RECORD OF OUR ALUMNI AROUND THE WORLD

BIRKHOFF



*Photo by Bachrach*

## MEN OF THE MONTH

The Lewis alumnus of distinction for this month is a professor of mathematics at Harvard University. As an engineering student would say, "He is a calculus shark of the nth power." In fact, he discovers new mathematical procedures for solving complicated problems. Although most of his professional career has been devoted to teaching and research in classical mathematics, he has been engaged as a consultant to work on problems that an engineer would call practical, and he enjoys doing it.

George David Birkhoff was born in Overisel, Michigan, on the vernal equinox, 1884. He received his fundamentals in mathematics, and probably the encouragement which helped develop his ability for original research, during the six years in which he attended Lewis Institute in high school and college courses. There was an understanding in the mathematics department in those early days that, when George went off into a brown study, he was to be let severely alone, for he was sure to come out of it with a new or different solution to the problem at hand. His A.B. and A.M. were earned at Harvard University, and his Ph.D. at the University of Chicago. He was instructor in mathematics at the University of Wisconsin, preceptor and professor at Princeton University, assistant professor and professor of mathematics at Harvard University. After being acting dean in 1935 he was dean of the Faculty of Arts and Sciences at Harvard University from 1936 to 1940. He has also been a visiting professor at a number of outstanding institutions, both at home and abroad.

The Birkhoff family originated in Holland, and David Birkhoff, George's father, coming here as a youth, studied at Rush Medical School and practiced medicine in Chicago. George Birkhoff went to Chicago public schools in the elementary grades, and entered Lewis in 1896. There he met his future wife, who will be remembered by alumni of about 1900 as Marjorie Grafius, active in dramatic and glee clubs.

As to physique, Dr. Birkhoff is a picture of health, tall and lithe, over six feet, with broad shoulders and a well-set head. By nature, he is intensely social. When introduced, he radiates genuine pleasure, and makes you think that he has been waiting all his life merely to meet and speak with you. In his undergraduate days, he had a native tendency to be retiring and

JENS



*Photo by Blank & Staller*

shy, and his former classmates express unusual interest in his social change. He now is interested in people and can readily be approached by his students, both present and former. At the Harvard Faculty Club, for example, a casual observer can not help but pick him out as a man of influence, sympathetic understanding, and personal charm. He is constantly sought out by his friends for advice and counsel. One acquaintance might discuss with him a paper which was presented to a scientific body the night before; another, the role mathematics will play in the future development of religious concepts, or again the moral obligation of science to the future of the world.

Birkhoff's interests are international in scope. He has circumnavigated the globe twice and has made many trips to Europe. He recently journeyed to South America under the auspices of the Rockefeller committee to promote good will in scientific activities among Latin American countries. A modernist, he made the entire trip by airplane. During this trip he received numerous honors from various universities in several South American countries.

Space forbids mention of all of his achievements, but they are listed in detail in *Who's Who in America*. As a frequent contributor to the *Transactions* of the American Mathematical Society, Birkhoff has done much toward establishing the reputation of that journal at home and abroad. In 1918 the *Transactions* printed his long and elaborate treatment of *Dynamical Systems with Two Degrees of Freedom*. This treatise systematized fragmentary theories and reduced the general problem to a finite number of typical or "normal' forms. For this essay he was honored by the society with the first award (1923) of its Bocher prize. No less than one hundred original articles on or associated with mathematics are to his credit. His principal research has been in differential and difference equations, calculus of variations, relativity, dynamical systems and stability, and the problem of three bodies in which he proved Poincaré's celebrated "last geometric theorem."

At the early age of thirty-four, Birkhoff was elected to the National Academy of Sciences. Such early election to that small body of research scientists is rarely achieved. He has received honorary membership in the Göttingen Scientific Society, the French Academy of Sciences, the Royal Danish Society of Sciences and Letters, the Royal Academy of Lincei, the Academy of Sciences at Bologna, the Royal Irish Academy and the Royal Society of Edinburgh. He is one of the few non-Italian members of the new Pontifical Academy of Sciences. Of special prizes, he has received from Venice, the Quirini-Stampalia prize, and a Pontifical Academy prize for researches on systems of differential equations. He was made an officer of the French Legion of Honor in 1936. Honorary degrees have been awarded to him by Brown, Wisconsin, Harvard and Pennsylvania Universities in this country, and by the European Universities of Paris, Poitiers, Athens, Sofia and St. Andrews.

He is past president of the American Mathematical Society and of the American Association for Advancement of Science. His educational influence goes beyond the bounds of a single department. His excursions into other fields are best illustrated by his book, *Aesthetic Measure*. In this volume, with a twinkle in his eye and his tongue in his cheek, he applies mathematics to music, art, and poetry. For example, he sets up a mathematical evaluation for an artistic vase. If the contour of a vase stands very high in rank, then a masterpiece has been found. By means of equations, he measures music and the melodic quality in poetry.

Birkhoff's philosophizing is not all technical. Recently, in one of the morning chapel talks in the Memorial Church of Harvard University, he spoke on *Mathematics and Religion*. In the conventional manner he selected an appropriate text and delivered a brief talk on that theme—his "only sermon," so he asserts. He suggested that mathematical theories are destined to provide essential means not only for the material and intellectual progress of mankind but for its spiritual progress as well, in a mathematical universe.

Illinois Institute of Technology is proud of many of its alumni in various fields of activity. In the field of pure science, Dr. Birkhoff is outstanding.

HOWARD A. CARTER.

## WALTER G. JENS

In nomination for the man-of-the-month, the *Engineer* presents Walter Galt Jens, a graduate of Armour Institute of Technology with the class of 1910 in the department of civil engineering. He is now vice president in charge of operations for the Duquense Light Company and is located in Pittsburgh, Pennsylvania. The Duquesne Light Company supplies power and light to Allegheny and Beaver Counties, with the Pittsburgh area as its largest consumer.

Mr. Jens was born in Rock Island, Illinois, December 3, 1887, and attended grammar and high schools in that town. He was graduated from high school in 1904 and excelled in many sports, including football, baseball and track. He was recipient of letter awards in all of these activities.

Before entering Armour in 1906, he was employed by the U. S. Engineers in the Rivers and Harbors Division, completing surveying and construction work on dams and dredging projects on the Mississippi River. While in college, he continued summer work with the U. S. Engineers, except for one summer when he was required to spend his time at the Institute Camp then located in Michigan. Between his junior and senior years, he spent part of one summer as an assistant and instructor in this camp.

Aside from his great interest in his fraternity and general activities about the Institute, he found time to win letters in track and baseball. He alternated playing first base and right field; on the track team he concentrated his efforts in the field events.

After receiving his B.S. degree in civil engineering in 1910, he immediately began work as engineer in charge of surveying for the Chicago branch of the Standard Gas and Electric Company. This company is now affiliated with the Duquesne Light Company. From 1910 to 1913, he was in charge of surveying for transmission lines in Minnesota and Wisconsin for the Consumers Power Company. Upon the completion of this work, he became resident engineer for the construction of the hydro-electric plant on the Apple River.

In 1914, he was promoted to the position of assistant superintendent of construction of the Coon Rapids dam on the Mississippi River, a project designed to supply power and light for the Twin Cities. At the conclusion of this construction job, he became construction superintendent of the Cabin Creek power plant in West Virginia, which is used as a central generating plant to supply light and power to all coal fields above Charleston.

During the first world war, Mr. Jens was a member of the Engineers' Reserve Corps at Fort Snelling, but was not called to active duty since his work in the construction of power and light systems was regarded as essential. From 1917 to 1926, he continued as construction superintendent, completing projects at Mobile, Alabama, and later along the west coast. He later went to Minneapolis and supervised the construction of the interlaced transmission lines covering Min-

nesota, Wisconsin, North and South Dakota, and northern Iowa.

Early in 1926, he became construction superintendent of the Byllesby Engineering and Management Corporation, and was stationed in the Pittsburgh branch office. He was placed in charge of construction of the Colfax power station, then under construction. During the period 1927 to 1929, he was manager of construction and engineering for the Byllesby organization; during this time the Reed power station was under construction.

On August 15, 1929, he became operating manager of the Duquesne Light Company, a position he held until April 1, 1938, when he was appointed vice president in charge of operations. In this position he was responsible for maintenance and operations for the Duquesne Light Company, the Allegheny County Steam Heating Company, the Equitable Auto Company and the Harwick Coal and Coke Company.

Mr. Jens was married in 1914 to Miss Nina Dixon of Union, Virginia. They have two children, Margaret and William G. Margaret is a graduate of Smith College and is married to Lieutenant George Leslie, assigned to the Bureau of Ships, U.S.N. William attended Carnegie Institute of Technology for several years and was graduated in law from the University of Virginia. He is now a lieutenant in the U. S. Naval Reserve and is serving overseas.

Mr. Jens' hobbies include fishing, hunting and golf. He has done a great deal of deep sea fishing, and has spent many hours testing his fishing skill in northern Minnesota and in Canada. Although he is president of the South Hills Country Club, he manages to play a good enough game of golf to stay in the high seventies. He is a director of the Engineers Society of Western Pennsylvania, and a member of the Metropolitan Club, University Club, Pittsburgh Chamber of Commerce, and Phi Kappa Sigma fraternity. He lives with his family at 254 Orchard Drive, Mt. Lebanon, Pennsylvania.

HARRY P. RICHTER.

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## 1897

SIMS, WILLIAM F., E.E. A., has recently retired as Chief Electrical Engineer of Commonwealth Edison Company after completing thirty-two years of service. He began as an assistant engineer. Mr. Sims was honored by company associates at a luncheon given at the Union League Club.

## 1901

HOFFACKER, HOWARD, Ac. L., now resides at 776 South Street, Elgin, Illinois.

## 1902

ERWIN, HENRY P., A.A. L., is now connected with the Ordnance Department and has the rank of Lieutenant Colonel. He may be reached at Chief Administration Branch—Technical Division, 4-D-420 Pentagon Building, Extension 5529, Alexandria, Virginia.

MILLER, HARRY P., E.E. A., Professor at Pratt Institute, Brooklyn, New York, has recently moved to 965 East 39th Street, Brooklyn 10, New York.

## 1903

JUHNKE, PAUL B., M.E. L., on July 19, 1943, completed forty years of service with the Commonwealth Edison Company of Chicago. He now holds the position of Chief Operating Engineer. Mr. Juhnke lives at 5403 Lakewood Avenue, Chicago, Illinois.

## 1904

LEMON, DR. HARVEY B., A.A. L., has recently accepted the position of Chief Physicist at the Aberdeen Proving Grounds, Aberdeen, Maryland. He also holds the positions of Professor of Physics, University of Chicago, and Curator of Physical Science, Museum of Science & Industry. Dr. and Mrs. Lemon, A.A. L., may be reached at Route No. 2, Aberdeen, Maryland.

## 1907

HEUCHLING, FRED G., Ch.E. A., according to a newspaper article, is Assistant Director, Victory Garden Department of the O.C.D. He resides at 1310 Glenlake Avenue, Chicago.

WYRE, DONALD H., Ac. L., has changed his business address to Room 612, Oliver Building, 535 Smithfield Street, Pittsburgh, Pennsylvania. He is General Manager of the Allegheny Division of the General Electric Company.

## 1908

BANG, MRS. HOMER W., A.A. L., formerly of Coral Gables, Florida, now resides at 1400 Lake Shore Drive, Chicago, Illinois.

## 1911

CHENEY, HOWARD L., A.A. L., Major in the Air Corps, is probably flying in active service, according to a letter dated May 22, 1943. He writes that for six months he had been with the Corps of Engineers as a liaison officer at the Southwestern Division, Dallas, Texas. He expected to leave very shortly for overseas service.

## 1912

SCHMIDT, FRED, C.E. A., is Assistant Superintendent of Personnel Service at Western Electric Kearney Works, Kearney, New Jersey. His home is at 674 Sheridan Avenue, Plainfield, New Jersey.

## 1914

FARRAR, FRED D., A. A., Major in the United States Army Air Corps, is in charge of maintenance at Bolling Field Army Air Base, Anacostia, D. C. His residence is 3703 Bangor Street, S. E., Washington, D. C.

LANG, EUGENE C., E.E. A., is now Commander in the U. S. Navy, according to a letter received by Professor John J. Schommer. The letter reads as follows:

Dear Uncle John:

Just received a copy of the *Technometer* which I have read with much interest. Also discovered a copy of your last letter to the alumni which I re-read with much interest. Yes I imagine the old campus "ain't like she used to be" and by the way you have another Commander to add to the collection of Armour Alumni. He is none other than the writer hereof who received official notice the other day to drop the "Lt." before his designation as of March 4, 1943 and thereby add one-half a stripe to the two and one-half worn since last summer. This rank of mine is in the Civil Engineer Corps of the Navy in spite of the fact that all other records indicate that I am no civil engineer.

I wonder if you will be good enough to advise the Alumni Association of this change and also of my present address.

With kindest regards, I am

Very sincerely yours,
(Signed) EUGENE C. LANG,
E.E.'14 Armour.

## 1915

KLEIN, VAL L., M.E. A., operates a cabin camp and small woodworking shop at Jerome, Idaho.

## 1917

BAUER, WILLIAM E., JR., M.E. A., is Lieutenant Commander in the U. S. Navy.

## 1918

CABLE, DONALD E., Ch.E. A., has been transferred from the Office of the Chief, Chemical Warfare Service, Washington, D. C., to the Inspection Division of the Edgewood Arsenal, Edgewood, Maryland. He is Major in the Chemical Warfare Service and may be reached by addressing his mail to Inspection Division, Building No. 11, Edgewood Arsenal, Edgewood, Maryland.

## 1919

FOSTER, ETHEL H., H.E. L., has recently moved to 1003 Oak Street, Santa Ana, California.

## 1920

BARTKY, JOHN A., A.S. L., formerly President of Chicago Teachers College, is now Lieutenant Commander in the U. S. Navy and is stationed in Washington, D. C. He and Mrs. Bartky, A.S. L'28, reside at 2043 North Glebe Road, Arlington, Virginia.

## 1921

JUDSON, LYMAN DIXON, Ch.E. A., requests that his mail be sent to Colonel Lyman D. Judson, 1st Hq. & Hq. Det., Sp. Trs., XIII Corps, Fort Devens, Massachusetts.

VYSE, ARTHUR F., JR., Ac. L., Lieutenant in the United States Naval Reserve, is stationed at Beeville, Texas. His residence address is 614 Delta Road, Highland Park, Illinois.

## 1922

KANTORER, MARTIN, M.E. L., writes that he is now a structural engineer with the Curtiss-Wright Corporation, Louisville, Kentucky. His residence address is still 7445 Phillips Avenue, Chicago, Illinois.

## 1923

BOLLER, GEORGE, A.S. L., is Captain on duty at headquarters of the VIII Fighter Command.

## 1924

JACKSON, CARL G., M.E. A., is District Manager of the Army Navy Electronics Production Agency, 222 West Adams Street, Chicago, Illinois. He resides at 5240 Sheridan Road, Chicago, Illinois.

LOWE, RUDOLPH P., M.E. A., has been made President of Proportioneers, Incorporated, 99 Codding Street, Providence, Rhode Island, to fill the vacancy created by the resignation of JEFF CORYDON, M.E. A'22. Mr. Lowe first served in Chicago as consulting engineer and began his services with Proportioneers in 1932. Prior to his election as President he was the company's Vice-President and Chief Engineer.

SIKES, ALFRED W., M.E. L., is Lieutenant-Colonel in the Chemical Warfare Service.

SORRANO, FRANK P., A.A. L., has recently moved to 5040 West George Street, Chicago, Illinois.

## 1925

OPENWALDT, EUGENE W., M.E. A., former Works Manager for the U. S. Gypsum Company, 163 Henderson Street, Jersey City, New Jersey, has recently been transferred to the company's plant in South Gate, California. His new address is U. S. Gypsum Company, 8430 Quartz Avenue, South Gate, California.

SCHREIBER, NORMAN B., M.E. A., is now President of the Andrews Steel Company, Newport, Kentucky.

## 1926

STEFFEN, EDWIN F., M.E. L., has been promoted to the rank of Major, U. S. Army. He is on duty with a Tank Destroyer Unit.

WEST, ANTOINETT, A.S. L., and BERTHA D. WEST, A.S. L., have recently returned to Chicago from Arizona. Their residence address is 3749 Pine Grove Avenue, Chicago, Illinois.

## 1927

DOHENY, JAMES J., Ch.E. A., is Second Lieutenant with the Chemical Warfare Service Technical Command, Edgewood Arsenal, Maryland.

VERMILYA, FLOYD D., C.E. L., recently wrote as follows:

Gentlemen:

. . . I was outside the U. S. A. from April, 1941, to July, 1942, on the construction of a U. S. Army air base and troop cantonment, and following Pearl Harbor, this was in the war zone.

I am now living in Kansas City, Missouri, employed on the construction of an alcohol plant for synthetic rubber, in charge of outside engineering.

My permanent mailing address is:
FLOYD D. VERMILYA,
907 North Lockwood Avenue,
Chicago, Illinois.

My present address is:
FLOYD D. VERMILYA,
214 East Armour Boulevard,
Kansas City, Missouri.

I recently had the pleasure of attending the meeting of Lewis and Armour Alumni held in Kansas City.

Yours truly,
(Signed) FLOYD D. VERMILYA.

## 1928

DOUBT, ROBERT D., E.E. A., is now living at 9310 South Elizabeth Street, Chicago.




## . . . in peace and war

This emblem is familiar throughout the nation as the symbol of a well-trained team, integrated for service in peace or war—The Bell Telephone System.

**1.** American Telephone & Telegraph Co. coordinates all Bell System activities.
**2.** Twenty-one Associated Companies provide telephone service in their own territories.
**3.** The Long Lines Department of A. T. & T. handles long distance and overseas calls.
**4.** Bell Telephone Laboratories carries on scientific research and development.
**5.** Western Electric Co. is the manufacturing, purchasing and distributing unit.

The benefits of the nation-wide service provided by these companies are never so clear as in time of war.

★ ★ ★ ★ ★ ★

## 1929

Friedman, Theodore W., C.E. A., writes that he has completed a tour of foreign duty and is now in the Bureau of Yards & Docks, Room 3409, Navy Department, Washington, D. C. He holds the rank of Lieutenant, U.S.N.R.

Miles, Karl W., E.E. A., has recently been promoted from Lieutenant to Lieutenant-Commander, U. S. Navy. He is now Resident Inspector of Naval Materiel at the National Company, Incorporated, 61 Sherman Street, Malden, Massachusetts, and is residing at 900 Main Street, Malden, Massachusetts.

## 1930

Chun, Edmund H., C.E. A., Edstrand, John P., C.E. A., and Miller, Clarence H., C.E. A'31, are with the War Department, Office of the Division Engineer, Missouri River Division, Farm Credit Building, 206 South 19th Street—Room 539, Omaha, Nebraska. Mr. Edstrand's mailing address is 505 North 41st Avenue, Omaha, Nebraska.

Stier, Herbert E., E.E. A., wrote the following letter to the Alumni Office:

Gentlemen:

It is indeed a pleasure to receive a copy of the *Technometer* monthly in order to keep abreast of what is happening at our Alma Mater.

It was interesting to note in the April, 1943, issue that the Rifle Club is now organized to handle a fire arms training school under the auspices of the National Rifle Association. This is more interesting to the writer in view of the fact that back in 1929 he had the pleasure of helping to organize the first rifle club at Armour Institute, and after all of these years to realize that the club is continuing the good work for which it was originally sponsored is a great satisfaction.

Those of us who are in the service and who are still interested in shooting fully realize the value that this preliminary training will give.

With every best wish for your continued success, I am

Yours very truly,

H. E. Stier,

Major, Ordnance Department.

Tobins, Lenore, A.A. L., a former registered nurse at the Roseland Community Hospital, is now at Waterbury Hospital, Waterbury, Connecticut. Her residence address is 64 Robbins Street, Waterbury, Connecticut.

## 1931

Hair, Thomas, J., Jr., A.S. L., who is serving our Country on foreign soil, recently wrote this very interesting letter to the Alumni Office.

Dear Mr. Wright:

I do not have much time to write, but as long as you are trying to keep track of the alumni—why here goes. I have been in ——— since last December. My branch of Service is Quartermaster and I am working in headquarters a Replacement Battalion. Our work is vitally important as it is up to us to get the right men at the right time to the right outfit at the front and also see that each man is fully equipped and is properly classified to do the best job for him in the Army.

Well, enough of that. Needless to say, we shall all have plenty to tell when we get home. To my friends who are in the service back home and elsewhere, I will take this opportunity to send greetings.

Sincerely yours,

(Signed) Thomas J. Hair, Corporal.

Tinay, John W., A.S. L., E.E. L'33, a former Instructor in Chemistry, Evening Division, Lewis Institute, is now serving in the U. S. armed forces.

## 1932

Berger, Max, Ch.E. A., now resides at 33 Walbridge Street, Allston 34, Massachusetts.

Erickson, Carl A., C.E. A., Lieutenant Commander in the United States Navy, recently wrote this very interesting letter to President Heald.

My dear President Heald:

I am happy to enclose a check for the Annual Roll Call of the Illinois Tech Alumni Fund. It would be greatly appreciated if you would forward it to the treasurer of this fund.

Sometime ago I received a request for a picture of myself from a committee at Illinois Tech assembling data on alumni in the military services. A picture is enclosed.

You may be interested to know that George Hanrahan, C.E. A'33, and Carl Lippincott, C.E. A'34, are stationed at Norfolk Navy Yard. George is working on ship design and Carl is working on welding design and testing. The three of us had a chance to get together recently and to reminisce about Camp Armour. George and Carl have sons about six years old and I have one son four years old and a baby boy four weeks old.



ERICKSON

The three boys played together and had a great time as respectable sons of Armour Alumni.

I have been stationed at the Norfolk Navy Yard for the past three and one-half years performing various public works duties relating to construction but have now received orders transferring me to the Naval Ammunition Depot at McAlester, Oklahoma, as Public Works Officer.

I have been greatly interested in reading about the activities of Illinois Tech with reference to the training of Army and Navy personnel and I know Tech is doing a great service for the country in this respect.

With best regards

Sincerely yours,

(Signed) Art Erickson '32,

C. A. Erickson,

Lt. Comdr. (CEC) U.S.N.

King, Theodore N., A.S. L., First Lieutenant in the U. S. Army, wrote this interesting letter to the Alumni Office.

My dear Friends:

. . . I received the alumni bulletins for which I am grateful. It is a pleasure to know that we in the service are remembered and kept in touch with what is going on back home. I am anxious that you continue to send me your releases.

Regarding a few lines to the other alumni; just let them know that we are out here doing our best to do a good job to preserve what we believe is the best way of living on earth; that we are putting all we have into this job in order that we may return to enjoy what we are fighting for; and that we are proud of the training and preparation which it was our privilege to obtain during our college years.

Very truly,

(Signed) Theodore N. King, A.S.L'32,

1st Lieutenant, FA.

Scanlan, Emmett A., Jr., F.P.E. A., Lieutenant, has been presented the Navy and Marine Corps medal for heroic duty as an officer. He earned this award while in charge of fire fighting groups on board a warship.

Spencer, Mrs. Katherine D., H.E. L., has taken the position of Assistant Safety Engineer at the Benicia Arsenal, Benicia, California. Her residence address is Benicia Dormitories, Benicia, California.

## 1933

From an island somewhere in the South Pacific, First Lieutenant Howard J. Cameron, C.E. A., wrote the following letter to the Alumni Office.

Dear Mr. Wright:

Many thanks for your note of June 1, which was forwarded to me from the States. Your promise to send me all Alumni mailings is appreciated.

Your request for a picture of me, in uniform, is most flattering, but I'm afraid my uniform would hardly conform with that normally worn by officers in the states, unless they've taken to wearing G. I. fatigues. But maybe they have—for it's been some time since I left the States.

To my knowledge, there are no other Armour Alumni on this chunk of coral in the South Pacific. However, I'll make inquiries and advise you.

My regards to President Heald, the faculty, and alumni.

Sincerely,

(Signed) Howard J. Cameron.

Devin, Sydney L., A.S. L., is Second Lieutenant in the U. S. Army.

Feinberg, Albert E., E.E. A., is now Second Lieutenant in the Signal Corps.

An article from The National Underwriter of July 1, 1943, reads as follows:

Jarl T. Sorensen, F.P.E. A., has been commissioned as Lieutenant (jg) in the Naval Reserve for active security and damage control duties. In order to accept active Naval duties, Mr. Sorensen secured release from the war department, from his former work as senior inspector, plant protection and industrial safety, internal security division, seventh service command, Omaha. Since May of 1942 he has been on a leave of absence from the North America for which he had served as engineer, special representative and field man with Chicago and Omaha service offices and in the Iowa field.

## 1934

Bennett, William H. K., Jr., A.S. L., is now with the Container Corporation of America, 12401 Euclid Avenue, Cleveland, Ohio. His residence address is 29612 West Lake Road, Bay Village, Ohio.

Becker, Peter M., M.E. L., Lieutenant (jg) in the U. S. Navy, may be reached at Box 10, Navy 121, c/o Fleet Post Office, New York City, New York.

Dickey, Diamond S., M.E. A., and Murphy, Ralph W., L. e 40, were appointed as exclusive representatives for the Chicago territory of the Esterline-Angus Company, Inc., of Indianapolis, Indiana. Their new address is: Murphy & Dickey, 537 South Dearborn Street, Chicago, Illinois. Telephone—Harrison 7881.

Ketler, Albert C., C.E. A., wrote the following letter to President Heald:

Dear President Heald:

Just a line to let you know that I have again been transferred to a new job.

The title is Public Works Officer at this station and the work involved is approximately the same as in any public works department in a small city, i.e., maintenance of utilities, streets and buildings.

If your travels take you down this way, I hope to see you again before the war is over.

With kindest personal regards, I remain

Sincerely yours,

(Signed) A. C. Ketler, Jr.,

Lieutenant

Public Works Officer

U.S.M.C. Air Station

Edenton, North Carolina

## 1935

Lomasney, Donald R., A.S. L., is now a Storekeeper Second Class in the United States Naval Reserve. You may reach him by addressing him at Navy Section Base, Navy 117, F.P.O., New York City, New York.

Banic, John M., E.E. L., who was formerly with the Pan American Ferries, Inc., has been commissioned Lieutenant in the U. S. Army Signal Corps and is stationed at New York City.

## 1936

Despaul, John E., A.S. L., has been promoted from 2nd Lieutenant to 1st Lieutenant in the Quartermaster Corps. Lt. and Mrs. Despaul, H.E. L., may be reached by addressing them as follows: O.R.P. Building 240, Fort Francis, East Warren, Wyoming.

Haeger, Arthur J., E.E. A., is a private in the U. S. Army and is stationed at Co. A 3301st ASTU, Blacksburg, Virginia.

Fourenze, Seymour J., A.S. L., Lieutenant in the U. S. Army, requests that the *Technometer* and other alumni mailings be addressed to 626-1 McClellan, Fort Leavenworth, Kansas.

## 1937

Bohmker, James S., A.S. L., writes that he received V-Mail letters from the Alumni Office and would like to thank us and to let us know just how much a letter means to men in the armed forces. He has been promoted to Lieutenant (jg).

Word has come to the Alumni Office that Diller, Donald E., M.E. L., has moved to 4120 Lisbon, Fort Worth, Texas, having been transferred there by the Consolidated Aircraft Company from San Diego, California.

Donnelly, Edward J., A. A., Seaman First Class, is stationed at Barracks No. 3, Wing 1-C, U.S.N.A.S., Olathe, Kansas.

According to a recent newspaper article taken from the Chicago Tribune, Captain Caryl Dufresne, C.E. L., is back from the war front. The article read as follows:

It was just like homecoming when Capt. Caryl Dufresne, 29 years old, 2015 Argyle Street, visited the Army Ordnance Show in Tribune Square yesterday. Since last November 8th, Capt. Dufresne and the 170 men in his ordnance company have been playing mechanic for the American army in Africa. The company followed the front, repairing field artillery even during the heaviest barrages the world has ever seen. The ordnance men arrived on salt flats while tank guns were still hot from battle, repaired those only slightly damaged and hauled back to workshops, on a huge ten-ton trailer, those

# Here's one Nazi broadcast that's the Gospel Truth!

## U.S. TANK IS BEST, SAY NAZI EXPERTS

### *Germany Will Doubtless Copy Gyroscopic Feature of General Sherman Tank, Berlin Radio Declares*

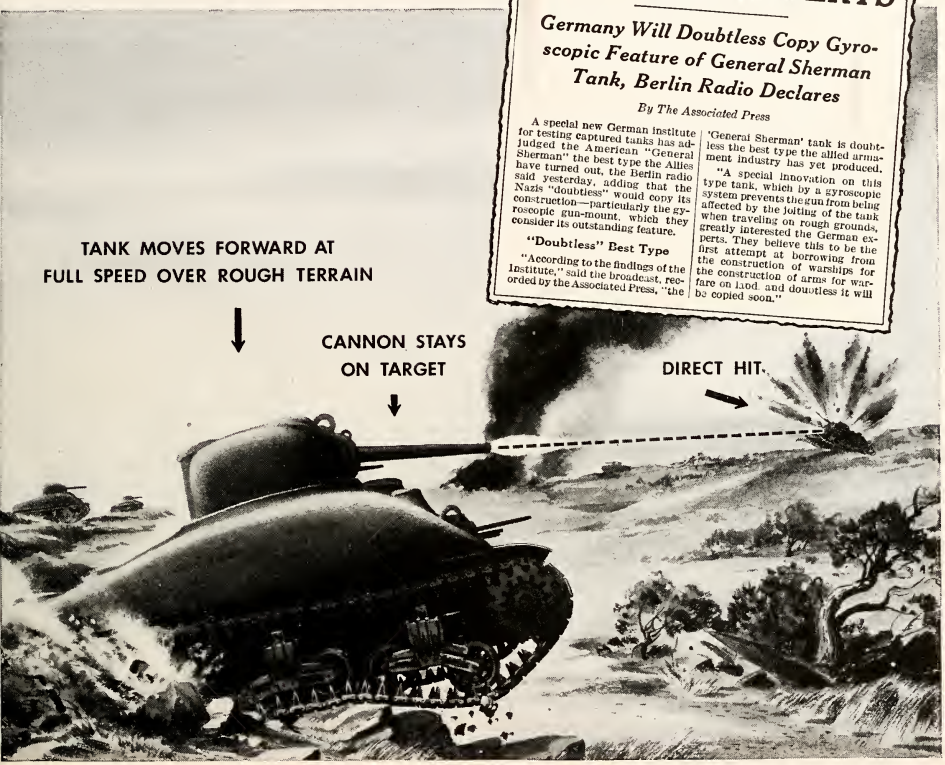
*By The Associated Press*

A special new German institute for testing captured tanks has adjudged the American "General Sherman" the best type the Allies have turned out, the Berlin radio said yesterday, adding that the Nazis "doubtless" would copy its construction—particularly the gyroscopic gun-mount, which they consider its outstanding feature.

**"Doubtless" Best Type**

"According to the findings of the Institute," said the broadcast, recorded by the Associated Press, "the 'General Sherman' tank is doubtless the best type the allied armament industry has yet produced.

"A special innovation on this type tank, which by a gyroscopic system prevents the gun from being affected by the jolting of the tank when traveling on rough grounds, greatly interested the German experts. They believe this to be the first attempt at borrowing from the construction of warships for the construction of arms for warfare on land and doubtless it will be copied soon."




WHEN THE GERMAN RADIO paid glowing tribute to the General Sherman tank—for once it was telling the truth.

You see, tank battles used to be stop-and-go affairs, because a tank's heavy cannon could be aimed accurately *only when the tank was at a complete standstill.*

That was bad—because every stop naturally made the tank a juicy target for the enemy.

Then the Army Ordnance Department called on American industry for the solution of this problem. So the men of Westinghouse went into a huddle. And out of it came what has been called one of the greatest military developments of this War—a tank gun stabilizer that permits *incredibly accurate fire while the tank is charging ahead at full speed over rough ground!*

And then, to button up the job, Westinghouse went into production on these gun stabilizers so fast and so thoroughly that almost before you could say "El Alamein," they were being produced in sufficient quantity to equip every American tank!

No wonder the Germans thought well of the General Sherman. And no wonder they considered its gun stabilizer its outstanding feature. For this one device has revolutionized the whole combat technique of tank fighting!

For us, tank battles are no longer stop-and-go affairs, with every stop offering the enemy a "sitting pigeon." American tanks are now more than 500% deadlier than ever before.

And the Westinghouse Research Laboratories, which developed the device—the Westinghouse engineers, who perfected it—and the men and women of Westinghouse who make it in great numbers—are proud as Punch.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Penn.

» » **Westinghouse** « «

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

that needed to be overhauled.

"Whenever the Germans captured some of our tanks, they would use them against us, but we seldom used any German equipment except machine guns," Capt. Dufresne said. The ordnance company would base just behind the front line, dispersing its equipment over a field. Squads would be dispatched into the front whenever calls for help came back over radio or telephone. The repair base was a favorite spot for axis attacks with planes and artillery.

Sturgeon, John F., Ch.E. A., is a chemical engineer in charge of a laboratory for the Root Petroleum Company, P. O. Box 791, El Dorado, Arkansas. His residence address is 710 East Elm Street, El Dorado, Arkansas.

Wolff, Charles E., A.S. L., Warrant Officer (jg), U. S. Army, may now be reached at 614th QM Battalion, Camp Adair, Oregon.

Zalewski, Harry F., E.E. A., is stationed overseas.

## 1938

Frish, Harry M., A.S. L., writes us that he has changed his address to Lt. Harry M. Frish, O. & T. Div.—Hdqtrs., U.T.C., Camp Sibert, Alabama.

Sanczuk, Edward G., Ch.E. A., wrote this interesting letter to the Alumni Office.

Dear Mr. Wright:

I received the first of your V-Mail letters and the idea really sounds very interesting. If the other alumni of Illinois Tech feel as I do, I know they will appreciate these letters and will look forward to the next one. For me, it will bring back memories of days spent at the school.

As yet, I haven't had an opportunity to contribute to the Alumni Fund, but you have my promise to do so at an early date.

I enjoy reading the *Technometer* and *Engineer and Alumnus* for I can keep track of my former classmates that way.

I've been in the service for thirteen months and in that short time I was trained in Chemical Warfare Service, Laboratory Technichian in the Medical Corps, Engineers, and now I'm back in the laboratory of the medics again. The work is interesting and I certainly did move around in the Army.

My best wishes to the other fellows in the service, wherever they may be, and to those who die, a wish that they may find a joyful and everlasting peace.

(Signed) Pvt. Edward G. Sanczuk,
Det. Med. Dept.—B ooke Gen. Hospital
Fort Sam Houston, Texas.

Tosch, Herbert E., E.E. L., Lieutenant in the United States Army, is now stationed at the Electronics Training Group, APO 640, U. S. Army, New York City, New York, according to a letter received from his mother, Mrs. Albert H. Tosch.

## 1939

Burg, Irving X., M.E. A., wrote the following letter to the Alumni Office. He is Lieutenant in a bomb squadron.

Dear Sir:

Your letter concerning Armour—it will always be that to me—was received with great pleasure. I never knew how much the old place really meant and still means to me, until your letter came. It was nice reading and I suddenly awoke to the fact that it was such fine reading because I am so interested.

Not much to tell you about from this angle other than I have been on foreign service for a good many months now.

The place is ———, and if I say that there is no earthly reason for anyone ever wanting to visit this country, I am putting it mildly and in the most gentlemanly fashion. I hear that old Tech had a heck of a fine basketball year. That is O. K. and here's hoping the boys hung one on in baseball, too. In fact they may beat our record of '37-'38. (Just my ego coming out.)

Thanks again for the letter and keep 'em rolling.

Sincerely,
(Signed) Irving X. Burg.

Hillger, Richard H., M.E. A., a private in the U. S. Army may be reached at Co. G., Beaufort Inlet Defense Force, Chesapeake Bay Sector, New Bern, North Carolina.

Ratto, John J., Ch.E. A., is now on foreign soil according to a letter received from his Mother, Mrs. Katherine Ratto. He is Lieutenant in the Air Forces.

Swanda, Victor, M.E. A., has been promoted to the rank of Sergeant and is somewhere abroad.

## 1940

Allbright, William F., L e, A, First Lieutenant in the United States Army Air Corps, participated in a devastating raid on Palermo, Italy, according to a newspaper article appearing in the Chicago Daily Times. William left his job in the electrical department of the Chicago Surface Lines to enlist as an aviation cadet, December 12, 1941.

Borbas, John W., E.E. L., has been promoted from Sergeant to Staff Sergeant. He may be reached at Headquarters Squadron, Oklahoma City Air Depot, Tinker Field, Oklahoma City, Oklahoma.

Carlson, Holger O., A.S. L., is a private in the United States Army. His military address is Co. C., 385th Port Bn., Camp Stoneman, Pittsburg, California.

Chidl, William J., M.E. L., has been promoted from First Lieutenant to Captain in the U. S. Army Air Forces. He is now located at A.S.T.B., Patterson Field, Fairfield, Ohio. His residence address is 10 Neal Avenue—Apt. 10, Dayton, Ohio.

Egloff, Dr. Gustav, Sc. Hon. D. A., was awarded Columbia University's Medal of Merit. Dr. Egloff is director of research for the Universal Oil Products, 310 South Michigan Avenue, Chicago. For more than twenty-five years Dr. Egloff has been prominent in research, invention and development of processes for the refining of petroleum.

Korba, Roland A., A.S. L., Corporal in the U. S. Army, recently wrote this very interesting letter to the Alumni Office.

Dear Mr. Wright:

I sure was glad to get your letter way out here, and I'm always interested in the activities at Illinois Tech.

We saw action recently against the Japs. They were badly defeated. Being a medical soldier, I didn't do any actual fighting; however I did help our own fighting men by carrying the wounded from the front lines and later by taking care of a surgical ward. I should like to know if the Institute, as yet, has extension courses. No doubt, there are others in the service who would be also interested in furthering their knowledge.

Sincerely yours,
(Signed) Cpl. Roland Korba T/5.

Pasiuk, Theodore, A. A., is an Aviation Cadet in the U. S. Army Air Forces. He is training to be a navigator and may be reached at 87th Nav. Tng. Gp., Class 43-13-5, A.A.F.N.S., Hondo, Texas.

Ransel, James P., F.P.E. A., is Lieutenant in the United States Army.

## 1941

Atkins, Kate L., A.S. I., and Frank Atkins, A.S. I., brother and sister, are both serving in the U. S. Army somewhere abroad. Frank may be reached by addressing his mail to Lieut. Frank Atkins, A.A.F.—342, A.P.O. 637, c/o Post Master, New York City, New York.

Barnes, Richard M., A.S. I., is now Lieutenant in the U. S. Army Air Corps. His military address is Base Hqts. MBBR, Myrtle Beach, South Carolina.

Ensign Charles E. Durkee's E.E. I., present address is: B.O.Q.—A-46, Ward Island, Corpus Christi, Texas.

Hill, Jr., John C., M.E. I., Second Lieutenant, is Engineering Officer in the U. S. Army Air Forces, and may be reached at 21 Venice Inlet, Venice, Florida.

Johnson, Herman F., A.S. I., a Private First Class, may be reached at 13th General Hospital, Camp Joseph T. Robinson, Arkansas.

Myers, Jr., Kenneth H., E.Sc. I., is Lieutenant (jg) in the United States Navy according to word received from his mother, Mrs. Dorothy M. McKay.

Smith, Jr., Ray M., M.E. I., is Lieutenant



SMITH

with the Student Officer Detachment, Laughlin Field, Del Rio, Texas.

## 1942

Behrens, Charles W., M.E. I., is now the Senior Quality Engineering Representative to the J. I. Case Company, Racine, Wisconsin. His home is 1201 Racine Street, Racine, Wisconsin.

Brauss, William J., Ch.E. I., is Second Lieutenant in the U. S. Army Air Corps. His military address is Stockton Field, Stockton, California.

Brzezon, Edward, M.E. I., according to a recent letter received from his sister, is now a corporal in the U. S. Army and is going through special training. He may be reached at Co. C., 801st S.T.R., Camp Murphy, Florida.

Cafcas, Thomas H., A.S. I., wrote this very interesting V-Mail letter to the Alumni Office.

Hello There!

Received your newsie letter of May 18th the other day after it had been forwarded by my folks. I'm glad to hear such a service is being rendered to us fellows in service because any news from home is always welcome and when it concerns your own friends it is all the more welcome.

The Jolly R (as we've nicknamed our ship) is one of Uncle Sam's newest destroyers. We've had a busy time of it since putting her in commission and there is prospect of much more activity in the future.

Have not met any I.I.T. alumni since leaving the Naval Academy, although there were eight of us in the class that was commissioned in Jan. '43. However, I have met quite a few officers and enlisted men from the Windy City and we've had a swell time bragging about our home town.

Thanks much for your letter—write again soon. Please give my regards to all the old gang of '42.

As ever,
(Signed) Tom Cafcas.
Ensign T. M. Cafcas.

Clayton, Arthur, Ch.E. I., is stationed on foreign soil according to two V-Mail Letters received by the Alumni Office.

Condy, Louis H., Jr., A.S. I., a radio mechanic in the Air Corps Ground Forces, is stationed at 66th S.E.F.T.S., U.S.A.A.F., Brooks Field, Texas. He would like to hear from his former classmates.

Miller, Daniel F., Ch.E. I., is stationed abroad according to a letter received from his father, Mr. C. H. Miller. Mail will reach him if addressed to Lt. (jg) Daniel F. Miller, Degaussing Div., Navy Yard, Navy 128, Fleet P. O., San Francisco, California.

Douglas, Lawrence, M.E. I., writes that he is at present serving in a turret on one of our great new battle wagons. According to Lawrence, mail, even circulars, from home or near home is the greatest single morale factor in the armed forces.

Vizard, William F., E.E. I., a Lieutenant (jg) in the United States Naval Reserve is stationed at the Argus Unit, c/o Fleet Post Office, San Francisco, California.

## 1943

Berg, Dana B., Ch.E. I., is still employed by the Linde Air Products Laboratory, Buffalo, New York, according to a letter received by the Alumni Office. The letter reads as follows:

Dear Sirs:

. . . I am still an engineer at the Linde Air Products Laboratory and enjoying my work very much. I surely am very grateful to our "Uncle John" Schumacher for his efforts in placing me and I know that I speak for the other graduates when I say that his work in such lines and with the Selective Service is very deeply appreciated by all of us.

I'm very glad to get my copies of the *Technometer*. Keep them coming, will you?

I understand that we have an Alumni branch here in Buffalo. Would you please send me more information as to whom I can locate here about the branch.

Thank you very much and keep up the good work.

Yours sincerely,
(Signed) Dana B. Berg.

Hoffman, Harold E., F.P.E. I., a private in the U. S. Army Air Corps may be reached by addressing his mail to Squadron "A," 25th Training Group, Jefferson Barracks, Missouri.

McCabe, Robert F., A.S. I., Lieutenant in the U. S. Army Air Forces received the Air Medal and Distinguished Flying Cross for achievements performed in ——— according to a letter the Alumni Office received from his mother.

Marland, Bernard L., A.S. I., wrote the following letter to the Alumni Office.

Dear Mr. Wright:

Here I am in the heart of the dust bowl, Fort Riley, Kansas, where 100° in the shade is considered cool. The dust is terrific. You find it everywhere, in your food, in your bed, in your hair and in your skin.

At present I am an A.S.T.P. which means



# A World Is Born

In many laboratories . . . such as yours . . . brilliant intellect coupled with daring research gives form to *The Shape of Things To Come* . . . and many items of a bright new world are born.

The "CD" Nitriles, though very young in commercial availability, are already making substantial contributions in improved products and processes for this New World.

They are already serving as basic materials for synthesis, as solvents, plasticizers, extenders for synthetic rubber . . . a variety of plastics . . . rust-proofing and water-proofing agents . . . and in the formulation of low-melting-point waxes.

These new nitriles are produced in a wide range of alkyl chain lengths and consequently have widely varying physical properties. Present uses for them are merely indications of vastly expanded future applications. We suggest that you write for complete data and samples at once.

**Normally 11 different "CD" nitriles will be available . . . current production is limited to 5 members of each series having alkyl chains of 16 and 18 carbon atoms, except in cases of high-ranking, priority-rated orders.**

### Research Starting Points

Unusual Solvent Characteristics . . . Pyrimidines . . . Polymerization of Unsaturated Members of the Series.

### Pertinent Data

RCN . . . Organic Cyanides . . . non-toxic . . . exceptionally heat-stable . . . alkyl chains from 6 to 18 carbon atoms in the saturated series . . . 9-octadecenenitrile and mixtures of this and 9-12-octadecadienenitrile in the unsaturated series . . . molecular weights from 97 to 265 . . . melting points from —79° C. to 41° C. . . . Fairly reactive . . . boiling from 165° C. to 357° C. at 760 mm.




## Armour Chemical Division

1355 WEST 31ST STREET • CHICAGO, ILLINOIS

I'll go back to school after basic training which will be over in about ten more weeks. As of now, I have completed three weeks. I'm in a cavalry outfit right now but I'm not classified there. For our basic we are B.I. (Branch Immaterial) which means it makes no difference what basic we take.

The basic itself is not so tough but it's the heat that makes it seem so. Did you ever take a nine mile hike over a desert with a full pack and rifle in a 120° heat over a dusty road with no water at all? It's really tough when you have to do it in two hours. We lost so much salt through perspiration we have to take eight to ten salt tablets a day to keep going and not pass out. Yesterday we had a regimental dress parade. We had to stand at attention for forty-five minutes before marching. Over 200 fellows passed out from the heat. My clothes were soaked to the last thread. But with all this I like it. I have never felt better in my life, although I'm dead at the end of the day. I lost about five pounds. Two inches jumped from my waist to my chest and I have grown about a quarter inch. The only thing that makes me mad is the loss of my hair. We have to keep it short as a sanitary measure. With all this sand it's impossible to keep long hair clean.

Yours,
(Signed) Pfvt. Bernard L. Marland,
A.S.M. 16081903
B 2471 Troop I 2nd Trg. Regt.
C.R.T.C. Fort Riley, Kansas.

Pummer, Lee, E.E. I., recently wrote this very interesting letter to the Alumni Office.

Dear Mr. Wright:

I've been greatly pleased to have been contacted by my Alma Mater. Though I was able to complete only one year of my E.E. course before my induction and consider myself yet a student, I enjoy getting in on as much of the alumni news as I can. My correct address, which is on the envelope, should facilitate my getting the Association's mailings.

As you requested, I'm sending a few lines about my activities in the service. Early in 1942, I left the states for Australia. After short preparations there, I was shipped to New Caledonia to help hold it as a base and to train in jungle fighting. My work entails scouting and ground observation work. Later, we were moved to Guadalcanal, in support of the marines, and witnessed a good part of the Jap defeat. Having escaped without wounds or serious sickness, I'm still overseas enjoying a temporary rest.

I've been receiving both the *Technometer* and the *Engineer and Alumnus* lately. Not having lost my scientific yen, I read the latter from cover to cover; even the ads are good. As for the *Technometer*, it brings back memories, recalling familiar faces and places. I was particularly struck by the important part Illinois Tech is playing in Radar instruction. I've seen Radar apparatus in action and the service it renders, especially at night, is deluxe.

Sending my best wishes to the other Techmen in service and wishing success to every endeavor of the Association, I remain,

An ardent Techman,
(Signed) Pfvt. Lee Pummer,

Stromberger, Kenneth W., M.E. I., is an aviation cadet in the United States Air Corps. His military address is: Squad D.B.T.C. No. 1, Boca Raton Club, Boca Raton, Florida.

## 1944

Bina, Frank J., M.E. I., is Lieutenant in the United States Army.

Loomis, Jr., Russell F., a private in the United States Army Air Corps, wrote the following letter to the Alumni Office.

Dear Mr. Wright:

This is just a few lines to let you know that I have finally received your letter of March 22nd.

I was shipped from Fresno before your letter arrived. We left Fresno on the 23rd of March and were shipped up here to the University of North Dakota. Believe me it was quite a change from Fresno. Weather here is like that of Chicago with one exception. It is not quite as damp here as it is in Chicago, but the weather is just as unpredictable. Here we attend classes just as though we were back in civilian life attending school. The only difference is that we're in uniform and adhere to strict discipline.

It is a very pleasant atmosphere up here. People are friendly and willing to show a soldier a pleasant time.

There are several other boys here that are former I.I.T. students. Some are Co-ops and the rest are day students. We have many discussions about how it used to be at Illinois Tech and try to figure out how it is now. We wonder if any boys in uniform are attending classes and if so what branches.

News and time are now short so I'll have to close.

Sincerely yours,
(Signed) Pfvt. Russell F. Loomis, Jr.,
304 College Training Detachment
Sq. 6, Flt. 2, Bk. 5
University of North Dakota
Grand Forks, North Dakota

Strauss, Sherman H., A.S. I., is in the United States Army Air Corps. He may be reached by addressing his mail to Squadron No. 1, Boca Raton Club, Boca Raton Field, Florida.

Gedman, Donald K., A.S. I., is a member of the Navy V-12 program and is located at the following address: U.S.N. Training School (V-12), Company 3, University of Louisville, Louisville, Kentucky.

## 1945

Blettner, John E., M.E. I., is a private in the U. S. Army. His military address is Company B, 5th Btn., Engr. Repl. Trng. Center, Fort Belvoir, Virginia.

The present address of Howard R. Brown, M.E. I., is as follows: Corporal H. R. Brown, 804th S.T.R., Co. D., Camp Crowder, Missouri.

Huber, Richard H., E.E. I., and John Hiatt, M.E. I., 42, are both with the Naval Research Laboratory in Washington, D. C. Mr. Huber's address is: Richard H. Huber, Ratio Technician 3/c, 1-44 R.M.S., Naval Research Laboratory, Washington, D. C. Mr. Hiatt's address is: Radio Technician 2/c, 15-43 R.M.S., Naval Research Laboratory, Washington, D. C.

## 1946

Johnson, Robert L., A.S. I., a member of the Navy-12 program at the University of Louisville, recently wrote this very interesting letter to Mr. Wright, Executive Secretary of the Alumni Association and Instructor in Physical Education.

Dear Mr. Wright:

This letter is from those Tech men from Lewis who were sent down here to the University of Louisville in the Navy V-12 program. Included in this group are Earle Gornstein, A.S. I 46, Ralph P. Graziano, A.S. I 46, Eckhardt W. Kayser, A.S. I 46, Irving Rappaport, A.S. I 46, and Robert L. Johnson, A.S. I 46. We were in your gym and swimming classes. Believe me they were a big help in getting us into shape—except Irv. Rappaport—he's always been in shape. He did over 150 sit ups during a strength test. He was going to do more but the coaches were getting tired of watching him, so he quit. You keep giving the boys the workouts you gave us, Mr. Wright, and they will thank you just as we do when they get in the service. It is a lot easier on us than on those who have not had any such work. Perhaps you remember some of the above mentioned men. I am a pretty skinny guy and it does my heart good to tear along over our half-mile obstacle course while the big brutes puff along behind. It was that fifty laps around the gym that helps now.

All the men expressed a desire to write you a letter. They are all out on liberty now and don't know I'm mailing this. I just was the first one to find the time to write, so I'm using that time while I have it. I hope this letter reaches you.

Sincerely yours,
Robert Johnson,
U. S. Naval Training School (V-12)
Company 4
University of Louisville
Louisville, Kentucky

Neubauter, James H., E.E. I., new address is: Aviation Student, College Training Detachment (Air Crew), West Texas State College, Canyon, Texas.

# ENGAGEMENTS

## 1941

Private George J. Matthews, E.E. I., has announced his engagement to Miss Ellen Putman of 8627 Throop Street, Chicago, Illinois. Marriage plans are being postponed until after the war. Matthews is in the U. S. Army Signal Corps.

# MARRIAGES

## 1940

Miss Helen Reisman's marriage to Philip A. Charniss, A.S. I., son of Mr. and Mrs. Max Charniss of West 12th place, was announced by her parents, Mr. and Mrs. Joe Reisman of South Albany Avenue. The wedding took place September 1, 1942, in Waukegan. The bride has received degrees from the University of Chicago and Chicago Teachers' College.

Charlton, James D., Ch.E., A., wrote the Alumni Office that on April 3rd, he was married to Miss Cecelia E. Tallackson of 1328 North Lockwood Avenue, Chicago. The wedding took place at the United Lutheran Church of Oak Park and the wedding party included Harold "Biff" Doolittle, Ch.E. A'40, as best man, Jim Flood, Ch.E. A'40, and Grant Whitehead, M.E. as ushers. Mr. Charlton is still employed at the Technical Service Division of Socony-Vacuum Oil Company of Brooklyn, New York. Mr. and Mrs. Charlton are making their home at 33-33 163rd Street, Flushing, Long Island, New York.

## 1941

Parkin, Richard L., Ch.E. I., was married to Miss Patricia Johnson, daughter of Mrs. Marion B. Johnson of Washington, D. C. Parkin is a Lieutenant in the United States Naval Reserve.

Key, Eugene G., A.S. I., a Lieutenant in the U. S. Army and now stationed at Patterson Field, Fairfield, Ohio writes that on May 3rd, he was married to Miss Winifred Abrahall of London, England, a member of the WAAF's. The American Red Cross News Service sent the following news release to the Alumni Office:

LONDON — Standing before an altar of spring flowers, Second Lieutenant George Key, signal corps, U. S. Army, and Winifred Abrahall, of the WAAF's, were married by Col. James L. Blakeney, senior chaplain U. S. Army, in the American Red Cross Reindeer Club, recently.



KEY-ABRAHALL

Lieutenant Key, 5224 North Magnolia Avenue, Chicago, Illinois, met his bride at a small church service at an RAF Station in Lincolnshire where they both were stationed. On the fifth time they met, he proposed, and on the sixth she accepted. Shortly after that they saw an American movie in which the hero married the heroine on very short notice. Mrs. Key, then Miss Abrahall, turned to her fiance and inquired, "Are all Americans fast workers?"

## 1942

On May 1st, Charles J. Ball, C.E. I., was married to Miss Sophie M. Maslanka of 3435 North Springfield Avenue, Chicago, Illinois. Since his graduation, Mr. Ball has been working at the main office of the Standard Oil Company of Ohio as Assistant Construction Engineer. Their home address is 2095 Northland, Lakewood 7, Ohio.

Groh, Anton J., C.E. I., on March 20, married Miss Mary Manelik, a Chicago girl. They now reside at 8808 Reading Road, Silver Springs, Maryland.

Ensign Carl H. Sparenberg and Miss Mary Louise Barkley of St. Louis, Missouri, were married at the U. S. Naval Air Base Chapel, Jacksonville, Florida, on February 26, 1943.

## 1943

Mr. and Mrs. Leo Terry of Rogers Park announce the marriage of their daughter, Kathryn, to Mr. Aloysius A. Cole, M.E. I., son of Mr. and Mrs. Walter Cole of Cedar Rapids, Iowa. The wedding on June 5th in St. Jerome's Church was followed by a reception at the

# *To the Young Man Who is . . . . . Or who is about to . . .*

What we folks at home are trying to do about postwar may seem sometimes remote and obscure. You haven't had much chance to get acquainted with peacetime industry, and to see it in its true role as a creative job-maker.

Take our own business, Alcoa Aluminum.

You know about the tremendous expansion in aluminum capacity. You see most of this seven-fold production going into the planes you are going to fly, the planes that will be your cover on the attack.

But Aluminum's true role is no more military than yours is. Both of us do have an immediate job to do; and then, the future—

Ever stop to think how many things in this old world are crying to be made lighter? Or how many ingenious, imaginative young men are going to be needed to apply and sell and manufacture the more than two billion pounds of aluminum that will be available every year when this thing is over?

Actually, we see the possibility of a million jobs, doing something with aluminum in peacetime, a million new jobs that did not exist before this war. There are grand careers ahead in aluminum!

We are devoting our eighth day of thinking time to doing what we can to make those careers as certain as anything can be. We call it Imagineering: letting the imagination search the realm of new products and new applications, and then engineering the dreams, the hunches, the markets, into clear paths to follow, someday.

Perhaps one of those paths will be yours to follow in the future.

*A PARENTHETICAL ASIDE: FROM THE AUTOBIOGRAPHY OF*

ALCOA ALUMINUM

• This message is printed by Aluminum Company of America to help people to understand *what we do* and *what sort of men* make aluminum grow in usefulness.

Edgewater Beach Hotel. The bride is a graduate of St. Scholastica Academy. The bridegroom is employed as Jr. Inspection Engineer with the Glenn L. Martin Nebraska Company, Omaha, Nebraska. They are making their home at 212 South 31st Avenue, Omaha, Nebraska.

### 1944

The marriage of Miss Dorothy Grace Popa, daughter of Mr. and Mrs. Eli Popa, 785 South High Street, Akron, Ohio, to DANIEL G. SECHEL, M.E. I., son of Mr. and Mrs. Daniel G. Sechel, Chicago, Illinois, took place April 3rd in the Rumanian Baptist church with Rev. John T. Cocutz officiating. Mr. Sechel is employed by the Van Tyle Engineering Company.

### 1941

The Reverend Frederick Eernard Hardy announces the marriage of his daughter Elizabeth Mary Anne to Mr. JOHN B. DOYLE, Ch.E. I., on Wednesday, June 1943, at Battle Creek, Michigan.

## BIRTHS

### 1936

Mr. and Mrs. EARL J. KIRSCH, E.E. A., of 267 Atlantic Street, N.W., Warren, Ohio, were pleasantly surprised on April 1st by the arrival of a son, James David, who was not expected until the middle of May. Mr. Kirsch is busy designing transformers for The Standard Transformer Company, Warren, Ohio.

SAMUELS, ROBERT F., A.A., Captain in the U. S. Army, is the proud father of a son, Robert Adkins Samuels, born on February 23, 1943. He heard the news about April 2, somewhere in Iran. Mrs. Samuels is the former Helen Adkins of Beverly Hills, Chicago.

## OBITUARIES

### 1897

HALL, BENSON F., M.E. A., died on January 9, 1943, while visiting in Chicago. For the past ten years he had been in retirement on his fruit farm in Eau Claire, Michigan.

### 1903

FELT, WINCHESTER W., Ch.E. A., died on December 12, 1942. He resided at R. R. No. 2, Chicago Heights, Illinois.

### 1904

LORIMER, LEONARD, Ac. L., who had been ill for several years, died on April 27, 1943. He lived at 510 South Elmwood Avenue, Oak Park, Illinois.

### 1911

SCHUTZ, STODDARD J., C.E. A., died on May 16, 1943. Mr. Schutz resided in Milwaukee, Wisconsin.

### 1915

PFAFFLIN, THEODORE K., F.P.E. A., for many years Manager, Service Department of the Home Insurance Company of New York, passed away on June 28, 1943.

### 1918

SHOTWELL, HAROLD H., E.E. A., died on June 6, 1943. He was connected with the U. S. Army Air Forces Materiel Command and traveled all over the country. His home address was 303 South Sixth Street, St. Charles, Illinois.

### 1936

FINGERHUT, MRS. WILLIAM (Elizabeth Emmert), H.E. L., passed away on June 21, 1943. She resided in St. Clairsville, Ohio.

### 1937

A military memorial service for Private GEORGE R. WIEGMAN, Ch.E. A., 343 Franklin Street, River Forest, Illinois, who died in a Japanese prison camp in the Philippine Islands, was held at 7:30 p.m. Sunday, July 18, 1943, at St. John's Lutheran Church, 305 Circle Avenue, Forest Park. The last the family heard from him was a cablegram sent April 7, in which he wished his mother a happy birthday on her anniversary, April 8th. Private Wiegman was a member of an Army Chemical Warfare Company in the Philippines.

### 1944

MILLER, CHARLES H., M.E. I., reported missing in action, is now known to be deceased according to official war information. Miller was Second Lieutenant in the U. S. Army Air Corps.

## MISSING IN ACTION

### 1937

AEBISCHER, HAROLD W., E.E. A., 2nd Lieutenant in the United States Army Air Corps, was reported missing in action on July 15, 1943. His mother resides at 3509 West 64th Street, Chicago.

### 1942

Mr. and Mrs. Henry A. Lasco of 1625 Mango Avenue were informed on August 25, 1943, that their son Lt. HENRY A. LASCO, JR., E.E. I., has been missing in action in the Middle East area since August 1st. Since his arrival overseas four months ago, Lt. Lasco, a pilot of a B-24 (Liberator) bomber, has been on many missions over enemy territory. The Chicago *Herald American* reports in its issue of September 1, that Lt. Lasco has been reported as being a prisoner of war in Rumania, following the raid on the Ploesti petroleum plants.

PERKINS, JOHN, A.S. I., was reported missing in action over enemy territory on July 23, 1943. Perkins was a Lieutenant in the United States Army Air Force.

## FIRE PREVENTION

(From page 15)

of Fire Underwriters, there were developed certain fundamentals and basic factors or standards, which could be used as a guide for anyone undertaking a critical survey of a community's fire-fighting facilities; these were incorporated in the *Standard Schedule for Grading Cities and Towns with Reference to Their Fire Defenses and Physical Conditions,* first published in 1916. The preparation of the *Schedule* was begun about 1914 at the request of certain of the insurance companies for the purpose of providing a means of determining the relative position of cities, as respects fire protection and fire prevention and the likelihood of large loss fires, and to be used as a guide in their underwriting; that is, to help in determining the amount of insurance to be carried in the various cities. Since that time it has been adopted by most of the state inspection bureaus as an instrument for classifying cities and towns; it was considered as a better instrument for that purpose than previously used town fire protection schedules.

Fire protection is composed of many items, somewhat interrelated, but differing in every city and town, and it became evident that in addition to outlining the standards there must be relative values assigned to each so that the personal viewpoint of the engineer making the survey should not overemphasize some features which, on first view, seemed serious, but as compared with the whole scheme of fire protection were really of lesser moment.

Because of this thought, the idea was adopted of assigning certain debits to each main feature and of subdividing these for the various items. The summation of the debits for any community, dependent on the extent of the departure from standard, produced a grading of the fire protective features of the city or town. These gradings do not measure the exact degree of fire protection of a community, as complete immunity from fire cannot be obtained so long as buildings and contents can be consumed by fire. The *Schedule* does, however, serve as a yardstick to determine the grading of one city relative to any or all other cities or towns, and has also served as a guide for consulting and operating engineers of water works, city managers and fire chiefs, and others interested in the betterment of their cities.

## ARMED FORCES

(From page 16)

the main, of similar educational background—high school graduates—and all are taking the first term of the basic engineering training course. This basic phase of the course runs through three twelve-week terms, and comprises an intensive educational program approximating the freshman year and part of the sophomore year of a standard college of engineering, stressing mathematics, physics, and chemistry, and including technical drawing, English, history and geography. The course is laid down in detail by the Army, and every man in the unit follows the same curriculum. Classes contain no students other than A.S.T.P. trainees. The curriculum does not lead to a degree, but the work all being at the college level, will, when the A.S.T.P. is discontinued, be accredited toward the bachelor's degree in equivalent semester hours by standard engineering colleges. It is emphasized that the A.S.T.P. is "not for the student, not for the college, but for the Army", and that its trainees are soldiers assigned to duty for that technological training which will best serve the purpose of the Army. The men, like the Navy V-12 trainees, are potential officer material, and will be assigned later to officer candidate schools in proportion to the Army's needs for junior officers.

The Navy V-12 unit includes about 700 apprentice seamen. About 300 of these are freshmen, and are assigned for housing, feeding and instruction on the campus at George Williams College, 54th Street and Drexel Avenue, by co-operative arrangement with that college, Illinois Institute of Technology being responsible to the Navy. The balance, about 400, are integrated with the sophomore, junior and senior classes of Armour College of Engineering, and are housed in the Graduate House and five fraternity houses on Michigan Avenue between 32nd and 34th Streets. They



## *PLASTICS—products of industrial initiative*

Plastics are a stimulating source of inspiration for architects and industrial designers in search of new ideas. When these intriguing materials are released from their military commitments, innumerable applications for the home front will arise. No products offer a better example of how progress can be accomplished when industry is given free rein to its initiative.

As a producer of basic chemicals needed for the manufacture of plastics, Dow is in a particularly fortunate position to promote their development. Three major Dow plastics—Styron, Ethocel and Saran—have already been produced. They possess distinctive properties that permit a bewildering array of uses in almost every field of human activity. There are also varieties of Dow plastic materials for coatings, finishes and other purposes in the electrical, textile and many other industries.

These plastic products do more than supplant other materials. They are veritable points of departure that lead to fresh fields. When normal conditions return, self-reliant industry, expanding on its own resources, will develop and apply them for the greater well-being of all America.

**THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN**

New York — Chicago — St. Louis — Houston — San Francisco — Los Angeles — Seattle

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CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY




are messed in the dining hall in the Student Union. V-12 trainees are encouraged to participate in the normal extra-curricular life of the college, and to this end, most of the men on the Armour campus are dues-paying members of the Illinois Tech Student Association. About 150 of them are former students of Armour College, many of them having been previously enlisted in the Naval Reserve. The program includes a minimum amount of actual naval study and drill. Dress parade and inspection is held each Saturday on Ogden Field.

The A.S.T.P. unit is quartered and messed in the old 108th Engineers, Illinois National Guard, Armory on Wentworth Avenue at 34th Street. The Armory and adjacent park are a military reservation, and the unit is organized and administered as a military camp. The men are not expected to participate in the usual undergraduate life of the college. The 500 men of the unit comprise a battalion of two companies, each of 250 men, in four platoons of two sections (thirty-one men), each. Individual classes comprise, usually, one section each, though some lecture courses are presented to larger groups of two or more sections each.

Physical training is, necessarily, emphasized in both Navy and Army programs. Each devotes six hours a week to physical education; the Navy, one hour a day, the Army, two hours a day on alternate days. In each case, the program is laid down in detail by the service. The Navy unit has a commissioned officer in general charge of physical training, who works in cooperation with the Institute's department.

The Navy V-12 unit is under the command of Lt. Wayne A. Hamilton, U.S.N.R., with Lt. (j.g.) M. P. Anderson as Executive Officer, Lt. Com. J. W. Sours, Medical Officer, and a staff of three other commissioned officers.

The 3666th Service Unit is commanded by Colonel Grover B. Egger, Inf., U.S.A., with Capt. George L. Hudson, Inf., U.S.A., Executive Officer, and a staff of four other officers.

The Institute is profoundly grateful to these officers for their unfailing cooperation in the establishment and carrying forward of the educational programs. They have been eager to find and appreciate our merits—and unfailingly patient with our deficiencies.

## SOCIAL SCIENCE

(From page 19)

and business decisions are made which, when taken all together, determine the broader structure. The research of Professor Henry P. Dutton is concerned with the management of industrial organizations—the manner in which the efforts of a number of men can be most efficiently combined to perform a group task.

In the past, most of our knowledge of management principles and procedures has been the by-product of the experience of individuals, who, themselves successful executives, found time to reduce to writing the things they learned in practice. Though the possibilities of successful laboratory experimentation are still somewhat limited in this field, the point has been reached where the generalizations of such men as Taylor need to be supplemented by systematic analysis. Professor Dutton is responsible for a large number of contributions in this direction, and is the author of a standard work on industrial management. Most recently, he has carried out a study of the present status of incentive wage payment plans which is

# Neither too little nor too late, Dr. Goebbels!

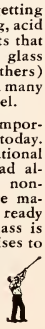


IT'S fashionable in some quarters to tell of America as a nation that lets clever people like the Germans run circles around it in technical skill. We have a hunch the idea comes from Dr. Goebbels' propaganda factory in Berlin. Anyway, it's not true.

In the glass field, for example, America was surprisingly well prepared for war. Take Laboratory glassware, vital in the manufacture of dyes, explosives, foods, and many war supplies, as well as to health. In 1914 we depended upon Germany for this material. But in 1915 Corning developed Pyrex brand laboratory ware and now this country needs German glass no more than it needs German wheat!

Despite war's demand, Corning is keeping pace with laboratory ware, insulators, communication equipment, and signal glassware required for planes and ships. Chemical industries are getting necessary quantities of glass piping, acid pumps, and glass mechanical parts that replace scarce metal alloys. Even glass precision gauges (ring, plug and others) are now being produced that are in many ways superior to ones made of steel.

These are just a few of the war-important items flowing out of Corning today. The main point is that when the national need arose, Corning research had already explored the things that non-critical glass could do to replace materials vital to war effort and was ready to help. Yes, to the engineer glass is really important today, and promises to be more so after the war is over. That's why the best advice we can think of for you is this: Keep up-to-date on glass! Corning Glass Works, Corning, New York.






"YOU HAVE DONE A GOOD JOB OF SENDING GLASS TO WAR"

CORNING
*means*
Research in Glass

scheduled for early publication in *Factory Management and Maintenance.*

There would appear to be many possibilities for quantitative studies in this field, such, for example, as the study of best size of operating unit in the public utility field made by Dr. Herschel F. Jones, recently a member of the IIT faculty. Such studies, involving a combination of economic and managerial analysis, and looking to the accumulation of specific data as well as to the development of methods of analysis, would be of wide utility. A principal limitation on university research in this field is the large cost involved in such studies, except when assistance can be obtained from the corporations which serve as sources of data, and which are principal beneficiaries of the information disclosed by the studies.

Exactly comparable with business management research, but dealing with governmental agencies instead of private business organizations, are a series of studies which have been pursued by Professor Herbert A. Simon. Private business can judge its success by the profit and loss statement, but public agencies do not have any such simple criterion for measuring their work. Professor Simon has been concerned with the development of techniques for measuring or evaluating the quality and quantity of public services provided by city governments. He has published four monographs dealing with this subject: a critical survey of measurement devices recommended for various city departments; a statistical analysis of the proper work load for case workers in a public welfare agency; a study of methods for measuring fire risk; and an analysis of the pattern of governmental services in a metropolitan area.

The measurement of services is only one of the tools which the public administrator uses in making his managerial decisions. Professor Simon is now engaged in a more general study of administrative behavior which seeks to analyze how administrators do, and how they should, evaluate situations in order to reach administrative decisions.

Another respect in which public agencies differ from private businesses is that the funds with which the former finance their activities must come from taxes instead of sales revenues. City governments in particular have faced a serious revenue problem in recent years because of their reliance on a single principal source—the real property tax. Professor Simon's researches in city government have carried him into an analysis of urban revenue problems and the effect of the property tax on city land values.

Human migration is an almost universal concomitant of social upheaval or disaster. The types of migrants are many: refugees fleeing before armies, coal miners unemployed because of increased mechanization of mining methods, farmers abandoning a dust bowl, emigrees dispossessed by revolution. Whatever the cause of a migration, technological or social, it is bound to have social repercussions on the area the migrants leave, and the area where they seek refuge. Professor D. Roy Mathews is pursuing a study of a particular migration, that of the clerical emigrees from France to England in the 18th century, with a view to determining the effect of the migration on English institutions.

Professor Mathews has under way a second project in the field of political geography, a topic of particular interest at the present time. He is engaged in a critical analysis of German theories of Geopolitik, the pseudoscience which the Nazis employed to justify aggression in Europe. The geopolitical doctrines are especially interesting in their attempt to rationalize a political program on technological grounds—for they purport to be based on the relation between population distribution and the distribution of natural resources. These theories, as well as the related doctrines of technocrats and regionalists in our own country, provide a fruitful field for the study of the interaction of technology and social structure in our modern society.

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## WOOD

(From page 22)

Casein glue is commonly used for interior work, and with a mould toxic added, may be used for an out-of-door job if housed against sun and rain. For actual out-of-door exposure, a waterproof glue is needed. At present, phenolic-resin glue is the standard for exposed use. It has been a high-temperature-setting glue, and its use has been more or less restricted to sizes and shapes to which the necessary heat could be applied. A new development is the use of glued laminated ship timbers, for keels, stems, frames, knees, etc. In the sizes necessary for these it is difficult to apply the high temperatures previously required, but phenolic resin glues which will set at temperatures as low as 200° are being developed.

The integrity of glued construction is the integrity of the glue line. Variable spread, too thick a spread, uneven surfacing, warped surfaces, all contribute to voids or variable strength. In general, the best glue line is the thinnest line that can be obtained, with the greatest uniformity of spread. The strength between contact faces depends further on the relation to each other of the direction of grain of two adjacent faces, and on the uniformity or variability of the stress on the surfaces. Glues and gluing technique are being improved all the time, and glued laminated construction, with its adaptability, its efficiency, and its economy, holds great promise for the future.

The present status of the war indicates the desirability of giving a little attention to postwar conditions.

Wood is the only replaceable natural resource. When war is over, we can compress wood into a material as hard and as strong as iron or mild steel. When oil is gone, we can make oil from coal, and when coal is gone, we can make coal from wood just as nature has always done, by applying sufficient heat and pressure. So wood is an inexhaustible resource for many purposes.

With timber connectors—those marvelous little devices buried between two pieces of wood, with the strength of several bolts and many nails; with glued construction made up from small pieces; with that new product, compregnated wood—wood compressed to a fourth or a third of its original size and impregnated with resin glue, with the strength of mild steel at one-fifth the weight; with all these things wood has a great future as a structural material.

It has possibly a greater future in chemical utilization and in derived products. The best that can be done thus far in manufacturing lumber is to utilize one-third of the tree. The rest has had to be waste—fuel and waste.

Using wood as fuel is utilization—of a sort, but not a very technical or profitable use. Wood, though, may be necessary as a fuel, and that utilization may continue. Utilization is gradually broadening, and increasing: paper, fiber board, rayon, cellophane, plastics. There is still great opportunity to utilize what now must be waste without even growing more trees, but there is still greater opportunity to grow more trees and utilize them.

Wood can be used in large sections, or in thin laminations or plys, or broken down to the wood fibers themselves. Compregnated paper pipe can

*Now, more than ever...*

# A SYMBOL OF FRIENDLY COMPANIONSHIP




As people adjust themselves to the new wartime routine, little things—everyday pleasures, take on new importance. Now, more than ever, Pabst Blue Ribbon Beer has become a symbol of friendly companionship.

That softer, kindlier taste of Pabst Blue Ribbon is achieved by *full-flavor blending*—a Pabst process that gives you all the taste tones of a well-rounded beer. Next time the occasion calls for beer, try Pabst Blue Ribbon. There is no finer beer in all the world.

**33 FINE BREWS** *blended into*
**ONE GREAT BEER**

Copr. 1943, Pabst Brewing Company, Milwaukee, Wisconsin

be made that is as strong as wrought iron. From wood, sugar can be made, and alcohol, and motor fuel, and breakfast food, and clothing—derivatives and products are illimitable.

We have great promise in our forests in the future. We have, in the Pacific Northwest alone, enough land, better suited for growing forests than for any other purpose, on which to grow, each year, twice as much timber as we cut in any one year.

Fire is the biggest problem. Given fire protection until the trees are old enough to make a forest cover, the forests will largely replace themselves —with some planting to fill in gaps and make uniform stands, but largely through natural reproduction.

## PSYCHOLOGY

(From page 25)

fessor Jesse E. Hobson, abundant opportunity for psychological service as well as for some research was made available.

The work of the psychological laboratory is represented by the following projects.

1. *Sound Localization.*

The findings of this study are reported in the *Journal of Experimental Psychology* for March, 1942, under the joint authorship of Boder and Goldman, the latter a student in the course of Minor Projects in Experimental Psychology. The title of the article is *The Significance of Audible Onset as a Cue for Sound Localization.* It has been known and proved experimentally that we may be able to hear a sound clearly and still be unable to determine the location or direction of its source. It has also been established by previous investigators that an interrupted sound is more easily located than a continuous sound. Think of the sirens of the fire engines which create in motorists that panicky feeling which is at least in part due to the difficulty of establishing by sound the direction from which the engines are coming. The work at the I.I.T. laboratories has established that a clear abrupt start or a clear abrupt discontinuance, even of a prolonged sound, will lead to readier localization of the source, especially outdoors, on even planes. (When this article was ready for press, it was found that A. Wilska, a Finnish investigator, working with the facilities of the Finnish broadcasting stations, had obtained somewhat similar results.)

The significance of this knowledge for the problem of sound localization and possible sound camouflage is obvious.

2. *Perceptual Skill.*

Let us imagine a Christmas tree with four or five groups of lights, each group connected to a different flashing device but the groups all mixed on the tree. Suppose also that each light is designated with a letter or number and that you are given the task of determining just by visual means which lights flash together. By preparing a board (Fig. 1) which has eight groups of lights, about six or seven lights to the group, flashing at different rates, it has been found that significant individual differences exist even within a population reasonably homogeneous, such as a group of college men and women. These differences show reasonable persistence even upon the repetition of the test. It seems that people differ greatly in their appraisal of visual time patterns, and the relationship of this ability to the efficiency of perception of auditory time patterns (rhythms) is found to be low. We apparently deal here with especial traits, which show great variations among the normal population. Steps are being taken to find the relationship between this trait and specific industrial or military performance.

3. *Teaching of International Morse Code*

This research has been done at the I.I.T. Army code school and was aimed not at the construction of a test, but at the improvement of teaching procedure of Morse code. It is estimated that about 10 percent of all functions in the armed forces require the knowledge of Morse code at some level of proficiency. It is also reported that a significant percent of "wash-outs" of candidates for various military activities is due to failure to reach a certain level of proficiency in the reception of Morse code. Through the steadfast cooperation of Professor Jesse E. Hobson, Director of the Department of Electrical Engineering, and the understanding attitude of Colonel C. N. Sawyer, Commandant of Signal Schools of the Sixth Service Command, it was possible to take at least the first steps toward the improvement of training procedures. A book under the title *The I.I.T. Morse Code Training Forms* is now off the press and is available for general use.

In conclusion it is gratifying to state that a number of Army psychologists received their fundamental psychological training at the I.I.T. psychology laboratories, before embarking upon their graduate studies. Of these, Lt. Ben Burack, Lewis, '37, and Capt. Arthur Hartman, Lewis, '32, deserve special mention.

## SHOP COURSES

(From page 26)

ing machines, and electric melting furnace.

Efforts are being made to make this laboratory neat and attractive.

In M.E. 319, Machine Tools Laboratory, students become familiar with drill presses, lathes, turret lathes, shapers, grinders, and milling machines by doing work on these machines. Emphasis is placed on knowing what can be done on the machine and how it should be done, rather than on the acquiring of skill in machine operation.

The lectures are correlated with the laboratory work, stressing the cutting speeds, feeds, tool angles, and time necessary for machining operations.

In M.E. 418, Metal Processing Laboratory, the students learn how to use welding equipment, both gas and electric, also how to inspect and make tests of weldments. The laboratory jobs are well prepared for the students. In the lectures, which are correlated with the work in the laboratory, the student learns the methods of welding, principles of metallurgy of welds, inspection and testing of


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welds, and economy of welding as against casting, riveting, or fastening with screws.

A considerable amount of welding equipment was transferred from the Lewis Campus to Armour, and a Richlé machine was installed for performing tensile and bending tests on weldments.

Production Methods Laboratory, M.E. 419, acquaints the student with the mechanism and mechanics of machines, with capacities of machines in terms of number of revolutions per minute, the feeds, the power required to run the machines either idle or when cutting metal, job analysis and time study of machine operations. There also is one complete project of making a simple tool, involving not only a sequence of machine work but also heat treatment of metal.

In the lectures the student studies tool life under operating conditions, force and power required to cut materials, forces on the tool point, quality control of shop products with engineering allowances for fits and manufacturing tolerances, methods of mass production, job analysis, tooling up for production, and design of simple tools.

Engineering Materials Course M.E. 230 was added at the request of Prof. J. I. Yellott. This rounds out the student's knowledge of ferrous and non-ferrous metals, and through laboratory study familiarizes him with the structure of metals, the effects of heat treatment on structure and on mechanical properties.

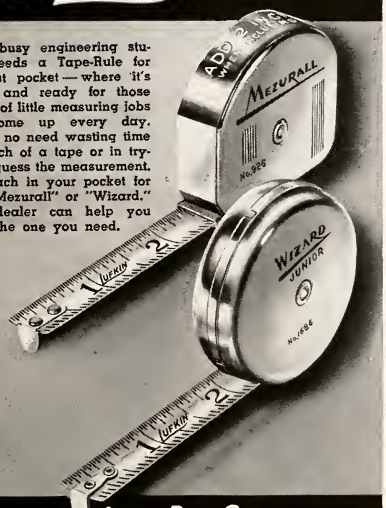
Effort is being made to either construct or acquire more testing equipment, and more modern machinery. Shop courses are being constantly



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changed to have more scientific and less vocational approach, for it is the province of engineering to know how things should be done and why.

This type of instruction will provide industries with engineers who are familiar with the machines, with the limitations of processes, tools, and machines, and with the difficulties encountered in processing of materials.

## MOUSE TRAPS

(From page 27)

the material to be heated is placed between the plates of a condenser connected to a high-frequency source, and the resultant heating is effected either through dielectric losses or by partial conduction.

In the curing of rubber and the heating of such materials as bakelite we see examples of the dielectric loss or hysteresis effect. The operation of high-frequency conduction heating is easily illustrated in the drying of materials, for wet substances containing electrolyte molecules are readily heated by this method. Virtually all moist materials contain a certain amount of electrolyte either as a part of the principal mass or as an impurity. Therefore when a wet material is placed within a rapidly reversing electrostatic field, billions of molecules try to migrate first one way, then the other. The result amounts to a rapid series of molecular collisions, which manifest themselves in a rise in temperature. This type of heating, then, is dependent upon the energy of molecular collision, and accordingly can occur uniformly throughout the mass of material. It is this significant fact which opens so many new horizons for high frequency heating by this method, for the heating is not impaired by poor thermal conductivity of the material, and energy can be made to reach otherwise inaccessible parts of a mass.

In the ordinary drying of materials through the direct application of heat in one manner or another, the heat must first enter the outside surface of the mass, then pass by conduction into the interior. By far the greatest number of industrial drying operations deal with materials which are poor conductors of heat. Consequently an appreciable temperature gradient is required to cause the heat to flow from the outside to the inside of the mass within a reasonable period of time.




At the start of such an operation it is difficult or perhaps impossible to achieve much of a gradient through the material, since the evaporation of moisture in the outer layers absorbs heat of vaporization as fast as it is supplied. The drying of the entire mass thus becomes controlled by such factors as moisture diffusion rate and thermal conductivity, and at the very best the successive portions of the material must dry in some sequence rather than simultaneously. Eventually there is danger of burning or scorching the outside while still drying the inside.

With high-frequency drying, on the other hand, the sensible heat appears in the inner and outer portions of the mass at the same time, and the inner moisture can begin its absorption of latent heat without waiting. As a matter of fact this phenomenon creates a further advantage in that internal expansion can sometimes remove a portion of the water mechanically, with a saving of latent heat energy. In the drying of wood by this method, for example, it has been observed that some water actually is forced outward in its liquid state, to drip off the wood without completing its vaporization.

These effects are sensitive to frequency changes, allowing a considerable degree of controlled action in the heating. Thus the method is applied to the bonding of plywood. The wood veneer sheets may be dried rapidly to the desired moisture content, after which the plastic bonding material is applied. When the several layers are compressed between high frequency condenser plates, heat is generated within the plastic material, causing an impregnation of the sheets and the setting of the tough plastic bond.

Popular fancy has been caught by the possibilities in cooking or sterilizing food products by high frequency. The effects in such applications are similar to those in drying. It is true, therefore, that high frequency will cook a beef roast throughout simultaneously, and that preserved foods may be sterilized without scorching their exterior portions. High-frequency cooking is surely slated for early post-war attention, together with many other interesting uses of these newly devised processes.

(From page 29)

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### Shortage of Engineers

See the *Journal of Engineering Education,* June 1943, page 748, on the the shortage of engineers. The salient features are that the total demand for 1943 will be 40,000 to 50,000, which the writer thinks is too low. Urgent calls are coming into this office for mechanical engineers, electrical engineers, radio, aeronautical, chemical, metallurgical and production engineers.

I received one telegram from a large industry, an old-line customer of ours, offering $200 a month to start (40-hour week) to the mechanical engineers graduating in October. Remember way back when—you old timers were glad to start at a salary of $60 to $75 per month and you were not much interested in time and a half nor how many hours a week you worked?

This past two years the placement department has repeatedly warned you alumni of draft age, if married, with or without children, that you had better shift to industries directly aiding the defense effort or seek a commission in the armed services. Hope you listened to this advice. On account of the scarcity of engineers, you belong in engineering jobs in the armed services or on war production and should not be carrying a rifle as a private.

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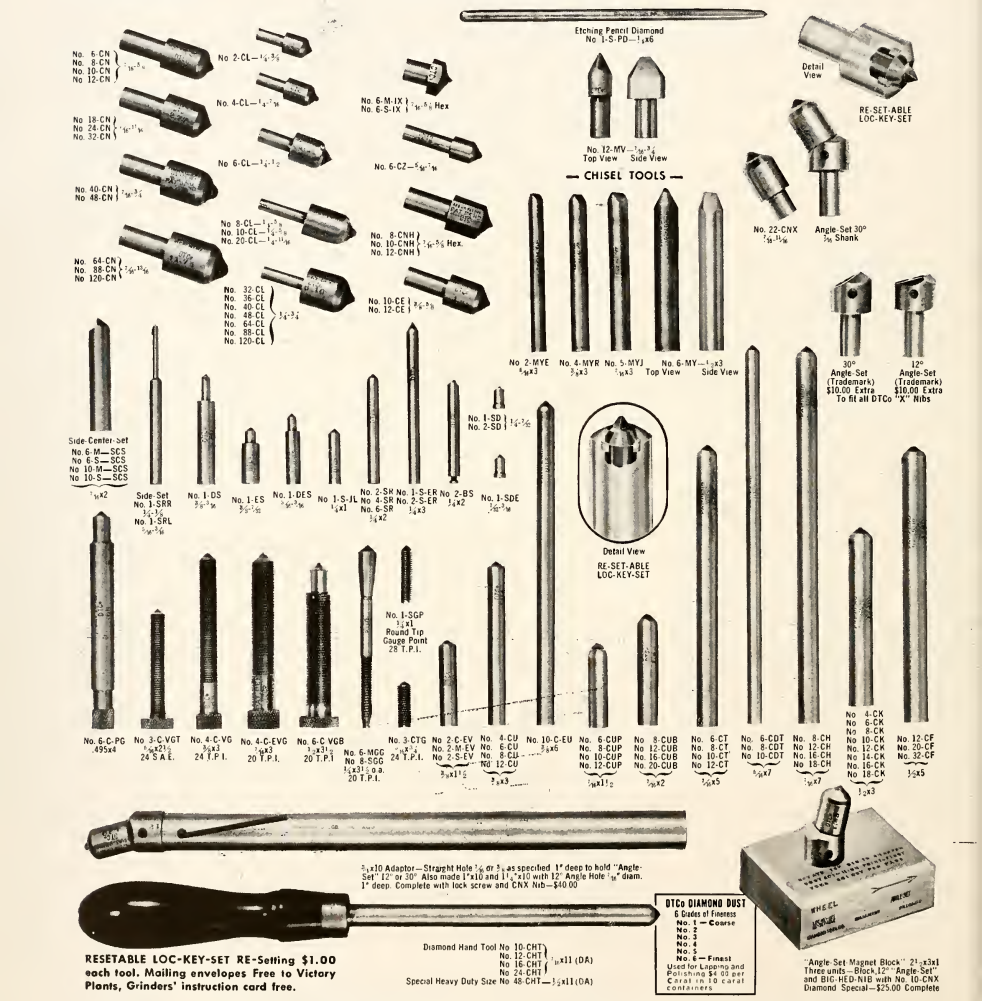
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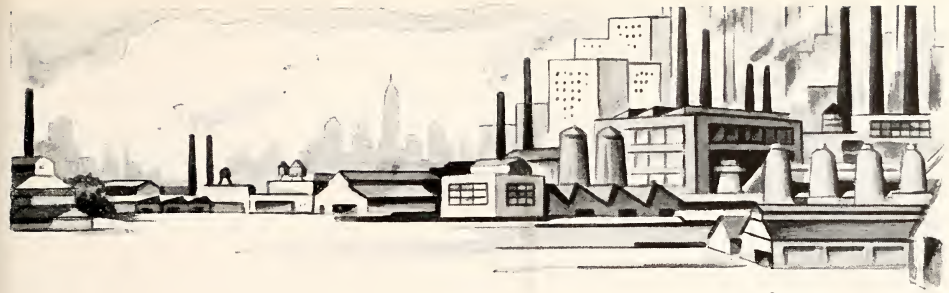
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## RECORD VOICE ON HAIR-LIKE WIRE

Sixty-six minutes of continuous speech can be recorded on 11,500 feet of hair-like steel wire on a spool no larger than the ordinary doughnut, in a new type of wire sound recorder being built by General Electric Company.

Operating under a license of the Armour Research Foundation in Chicago, engineers in General Electric's laboratory are now engaged in redesigning the apparatus so that it can be manufactured in mass production to meet the demands of both the Army and Navy.

The recorder, itself, is contained in a small box, weighing about nine pounds. It has many wartime uses, but perhaps none more important than in observation planes. Instead of the customary pad and pencil now used by pilots in making notes of what they see on scouting trips, they can dictate into a small microphone just as the busy office executive now uses a dictaphone. Instead of the observer's words being recorded on a wax cylinder they are recorded magnetically on wire which is but four one-thousandths of an inch in diameter.

Unlike the wax cylinder which is breakable, there is no apparent wear-out to the wire. In fact, 100,000 reproductions have failed to alter its quality in any respect.

When there is no longer any use for the recordings, the speech can be readily "wiped off" magnetically, and the wire is as good as new for future recordings.

Magnetic steel wire recording is not a new idea. As early as 1898 Valdamar Poulson, a Danish scientist, introduced the method and used it to record high-speed arc radio signals. However, suitable amplifiers were not available at that time and the quality was poor. With the new method developed by Marvin Camras, assistant physicist of the Armour Research Foundation, many changes have been made and the quality improved so as to compare favorably with the ordinary phonograph records.

A recent report from England stated that the sound recorder is now being used in the war zones and that "a fight talk of a Flying Fortress crew, attacking Nazi airfields in France, was recorded on a small spool of wire."

This was brought back to England, and according to Major H. L. Nussbaum, "All the conversation of the crew inside the Fortress as well as the sounds of battle were brought back as an oral record of the sixty-six minute flight."

## SMOKE WAS A LIFESAVER IN SICILY INVASION

The army's new smoke generator, the principle of which was developed in General Electric's research laboratory by Dr. Irving Langmuir and his assistant, Vincent Schaefer, proved a lifesaver in the invasion of Sicily, according to a statement by Major General William N. Porter, chief of the Army Chemical Warfare service.

"Smoke is our greatest protective weapon," General Porter said. "It is the greatest lifesaver of our troops and was responsible for the small number of casualties in Sicily where it was used."

This is the second time that commendation has been given by the army to the smoke generator. When the American forces landed in North Africa, they were protected by a pall of dense white smoke that poured out of these wheeled machines, completely concealing their movements, yet of no discomfort to the troops.

In the early days of the war when the Chemical Warfare service called on the National Defense Research Committee for a smoke generator, the problem was brought to the attention of Dr. Langmuir. It was not long before a smoke box was developed in General Electric's laboratory.

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- CENTRIFUGALS — perforate and solid baskets—any metal. Centroid speed control.
- MULTI-STAGE VACUUM UNITS—for vac. cooling—vac. refrigeration — deaeration — deodorization — high vac. distillation. Thermo-compressors — steam jet equipment — condensers, all types.

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given a picture of the object at the instant of illumination. Through "persistence of vision," the image is carried over until the object again reaches the given position and the light flashes again. Thus, the rapidly moving object appears as though standing still.

## CARRIER CURRENT RELAYING

With a blinding flash and a peal of thunder, lightning stabs a power line. The life line of a vital war industry is endangered. But production doesn't stop. When the short circuit occurs, the carrier current immediately detects and cuts out the section of line in trouble, permitting the rest of the system to carry the vital load, say Westinghouse engineers.

Located at intervals along power lines are radio transmitters and receivers. The instant a short circuit occurs, the electronic device produces a signal. This is immediately picked up and broadcast—not into space but along the power line to the radio receiver. In answer to the signal, the receiver automatically blocks operation of breakers in the good section. When the carrier signal is not received, it indicates the section in which the short circuit is located and permits operation of the breakers, quickly clearing the fault.

## 'WALKIE-TALKIE GOES TO SEA'

Although developed to ride a soldier's back in steaming jungles, desert wastes, or arctic drifts, the "walkie-talkie" one-man radio station built by Westinghouse for the Army has now gone to sea. Its ten-mile range is short enough so that ships in convoy can transmit voice messages from vessel to vessel without using the "big" radio, which might give away ship location to enemy listeners.

## MOTION VISUALLY 'ARRESTED'

What happens to a motor armature when it's rotating thousands of times per minute? Is a valve operating properly when the engine is running at high speed?

Westinghouse engineers use the Stroboglow lamp to get a visual answer. By a light flash delivered each time the object reaches a given point in its motion cycle, the human eye is

EQUIPMENT • FACILITIES • PERSONNEL • EXPERIENCE •
REPUBLIC
INSTRUMENTS
AND CONTROLS

# THE PROBLEM OF Stretching Capacity OF EXISTING BOILER EQUIPMENT

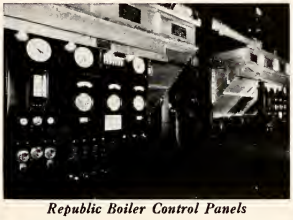
To the power engineer, industry's call for top-speed production is a call for more steam . . . a call which, in many plants, must be met by "stretching" existing generating capacity through shrewd operation, since new steam generating units are not immediately available.

The problem of "stretching" present capacity involves the acquisition of complete knowledge of existing conditions, so that losses in steam generation and distribution may be eliminated and optimum operating efficiency maintained. The correct solution depends on two fundamental procedures. First, the existing conditions must be determined by use of proper instruments. Second, the optimum conditions must be determined and maintained by the use of instruments and by proper methods of control.

Republic offers a complete line of power plant instruments and controls designed and built to meet today's power plant requirements. We will be glad to cooperate with you in the solution of any steam generation or distribution problem you may have.

### AUTOMATIC COMBUSTION CONTROL

Republic-Smoot automatic combustion control systems are built for



*Republic Boiler Control Panels*

all sizes of boilers — all types of fuel firing equipment — all load conditions — any arrangement of draft equipment.

### POWER PLANT INSTRUMENTS

Flow meters, draft instruments, $CO_2$ meters, thermometers — a complete line of power plant instruments, designed and built by Republic, for analyzing and checking plant performance.

### BOILER WATER LEVEL CONTROL

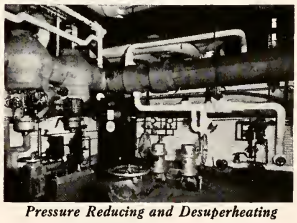
The Republic-Smoot boiler water level control system is designed to maintain boiler drum water level within $\pm$ 1 inch of the desired level when the boiler is operating under normal conditions.

### REGULATING VALVES

Republic-Smoot turbine type valves are designed for regulating pressure and flow of high-pressure superheated steam or boiler feedwater. They are built for tough jobs in which the valve occupies a key position in the operation of a system or an entire plant.

### DESUPERHEATERS

For control of steam temperatures in interconnected systems, several types of Republic-Smoot desuperheaters are available to meet special operating requirements.



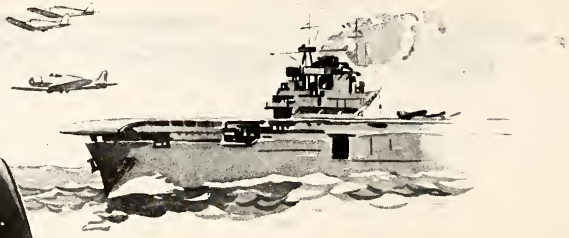
*Pressure Reducing and Desuperheating*

Whether your particular problem involves the use of a single instrument or the control of an entire process or plant, Republic engineers will be glad to study your problem and, in co-operation with your own engineers, make recommendations as to the most practical solution.

**Your request for our co-operation in solving your power plant problems will involve no obligation on your part. Write us today.**

**REPUBLIC FLOW METERS CO.**
**2224 Diversey Parkway, Chicago, Illinois**





# *Officer's*

## UNIFORMS *and* ACCESSORIES

You will have no problem whatever in buying your officer's uniform if you will simply be guided by the same standards of worth and excellence which you employed in the purchase of civilian apparel.

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*Complete price lists for all branches of the service will be mailed upon request. Delivery on day of purchase if desired.*

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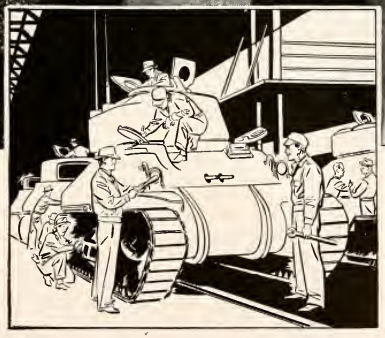
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# IT'S A WAR LOAD OF FIREPOWER





Coal stands for exactly that . . . "firepower" on the home front . . . taking part in endless war duties as well as the heating of civilian homes. America needs every pound of such firepower that coal mines can produce. The nation's requirements call for more than six hundred million tons in 1943.

Contributing in no small way to supplying this record demand is Peabody S-P coal. Pouring from six ultra-modern refineries in a steady stream, this famous coal with its stepped-up efficiency is eminently fitted for the vital war time job of helping to keep the nation adequately powered — and warm.

SP SUPERIOR PROCESSED COAL

Shaft mined from 5th and 6th veins, So. Illinois and 6th vein, Central Ill. district. Ash reduced at least a third by precision refining.

## PEABODY COAL COMPANY

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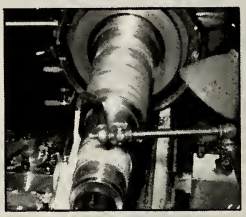
# 6 STEPS TOWARD TOP PERFORMANCE, WITH CARBIDES, WHEN YOU CUT STEEL



CUT AT HIGH SPEEDS—For top performance on the average steel-cutting job, don't cut at speeds less than 200 *feet* per minute. Slow speeds often cause failure.



USE CORRECT CHIP BREAKER—When you break chips, break them right. Fit breaker to the job. The ground-in step-type shown is usually best.



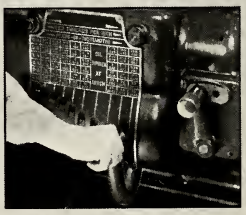
COOLANT—*IF* you use a coolant, provide a heavy, continuous stream, preferably under pressure. If you can't provide ample coolant, it is better to cut dry.



KEEP TOOLS SHARP—Avoid running tools until excessively dull. This causes breakage or drastically shortened tool life. Grind tools at regular intervals for best results.




PROVIDE RIGID SET-UP—Keep tools at absolute minimum overhang necessary to clear work. Chuck part firmly. Rigidity is important with carbides.



FEEDS—For medium and heavy cuts on steel, use feed not less than .010" per revolution, and preferably .015" to .025". Light feeds "rub" tool, causing rapid dulling.

● Important in getting top performance, when cutting steel with carbides, are the six steps shown above. When correctly applied, carbide tools produce results far surpassing the performance of ordinary tools. They operate at machine speeds as high as 4 to 5 times faster than ordinary tools, stay sharp up to 10 times longer, and increase output often as much as 300%.

Important, too, is the carbide you use. When you select from the complete line of carbides produced by Carboloy Company, you get the best type for your particular job—whether it be the popularly designated "titanium carbides", "tantalum carbides", "tungsten carbides"—or "tri-carbide" grades.

Send for catalog GT-142 listing specifications and prices of more than 300 standard Carboloy Cemented Carbide tools and blanks for machining all types of metals and non-metallics.

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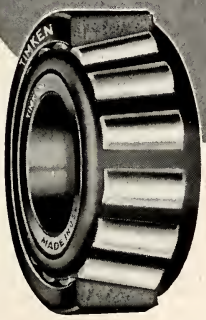
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THE new world —the world of the post-war era — will be a world of wheels to a greater extent than ever before. The development of new kinds of production and transportation equipment, and the recreation of existing machines will greatly increase the necessity for and importance of bearings capable of meeting new conditions of speed, precision, load capacity and endurance.

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Good Tobacco, yes . . . but the Blend — the Right Combination — that's the thing.

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# ILLINOIS TECH ENGINEER

## AND ALUMNUS



DECEMBER, 1943



# Pigments of the Imagination

Maybe "synthetic rubber" has only *begun* to make history.

For while it is pinch-hitting for natural rubber as few believed possible... while it has "bounced" into public consciousness as *another* rubber, better than crude for some purposes...chemists are already talking of uses for this remarkable group of raw materials in new fields *beyond* rubber.

The chemists should know! For it was in the research laboratories that the special pigments and compounding techniques were perfected which made "chemical rubber" practical for tires, and for other applications in which natural rubber could never be used. Without carbon black, for example, synthetic tires would not yet be a reality; with it the tensile strength of Buna S —the tire rubber—was increased seven to ten times! So that today about 40 per cent of a synthetic tire tread is carbon black.

Many important pigmenting materials, including carbon blacks, have come from the laboratories of Wishnick-Tumpeer, Inc., to give synthetic rubber much-needed properties. Among them are Witco No. 20 Softener which improves tear resistance in tire treads...Stearite, an unusually effective dispersing and vulcanizing aid... Witcarb, a remarkable filler which increases the tensile strength and wear resistance of man-made rubber...a special type carbon black, Witco No. 12, which reduces heat generation in heavy-duty tires ...Witco M.R. for increased resistance to flex cracking.

How far the synthetics may go in new directions depends largely upon such imaginative research now at work to "build in" to them added properties through pigmentation.

Success breeds success in research. Today's "pigments of the imagination" may be actualities sooner than you think, broadening the scope and application of so-called *synthetic rubber.* Manufacturers exploring its possibilities for product improvement or new product development are invited to draw upon the experience and facilities of Wishnick-Tumpeer.

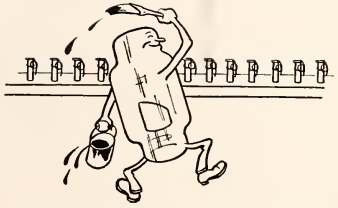

**WISHNICK-TUMPEER, INC.** MANUFACTURERS AND EXPORTERS

*New York 17, 295 Madison Avenue • Boston 9, 141 Milk Street • Chicago 11, Tribune Tower • Cleveland 14, 616 St. Clair Avenue, N. E.*
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CHEMICALS • PIGMENTS • ASPHALTUMS

# Campus News

RESEARCH AND ENGINEERING KEEP GENERAL ELECTRIC YEARS AHEAD



## PAINTING THE FUSE RED

WHEN General Electric's automatic X-ray machine, developed to check the proper amount of powder in hand grenade fuses, "sees red" there's too little powder in the fuse, and the grenade might explode as soon as the soldier released his grip on its handle.

For checking, the fuses are set upright on a movable belt that passes through the machine. The perpendicular beam of a 100,000-volt X ray penetrates each fuse and produces a glow on a fluorescent screen, above which is a phototube or "electric eye." As long as this glow remains constant, the fuse passes through untouched. But when a fuse with a light powder charge passes over the X-ray beam, the phototube detects the change in the glow, automatically rings a bell, flashes a red light, places a dab of red paint on the top of the fuse, and records the dud on a chart. This four-way check makes it impossible for a bad fuse to get by without detection.

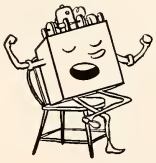
This machine, the first of its kind in the country, will automatically check 4000 fuses an hour.



## SH—H—H

TO help make "all quiet" on the factory front—at least as much as possible—General Electric has developed a new sound-level meter that gives a quantitative measurement of sound.

Because man's nervous system is severely agitated if he is subjected to a sound above 120 decibels, the efficiency of factory workers is often lowered considerably by machinery noise. Highly sensitive, the instrument's range of 24 to 120 decibels covers the normal range of man's hearing and warns when the noise is harmful. Thus proper steps can be taken to reduce the sound.



## YAWN PATROL

ON guard against over-fatigue of metals is the new electronic machine developed in our General Engineering Laboratory.

For metals, like human beings, get "tired" after a certain amount of work. One of the most important metallurgical tests is determining how much stress and strain certain metals can take under continuous vibration.

Energized by especially powerful electronic equipment, the new machine can vibrate a sample of metal back and forth about 10 million times in five hours—or in one-fourth to one-tenth the time previously required.

*Hear the General Electric radio programs: "The G-E All-girl Orchestra" Sunday 10 p.m. EWT, NBC— "The World Today" news, every weekday 6:45 p.m. EWT, CBS.*

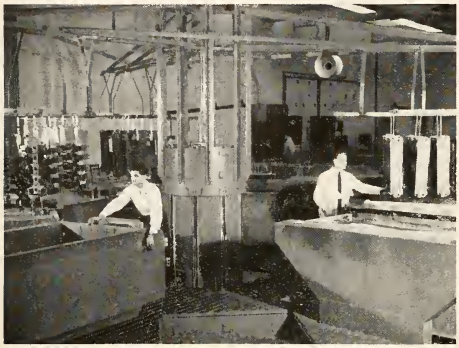
**GENERAL ELECTRIC**

963-74-211

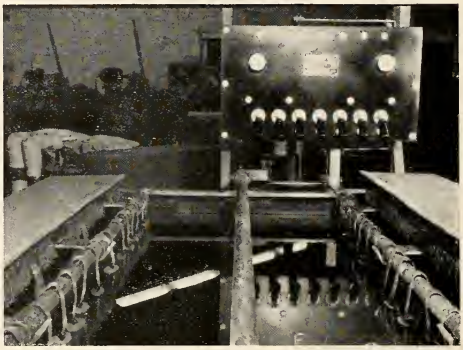
*192,000 employees of the General Electric Company are on their jobs producing war goods and buying over a million dollars of War Bonds every week to hasten victory.*

# Fumes at Sperry Gyroscope?

## NOT BY A BOMB-SIGHT!

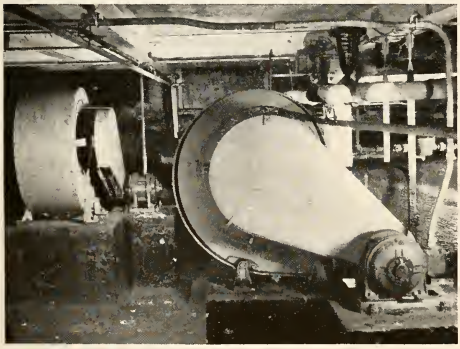


Udylite Rotary Unit. Automatically handles alkali cleaning, anodizing, dichromating, and drying process. Vent ducts lead to Ilg Blower below floor. Ilg Unit Heater on dryer operates automatically.

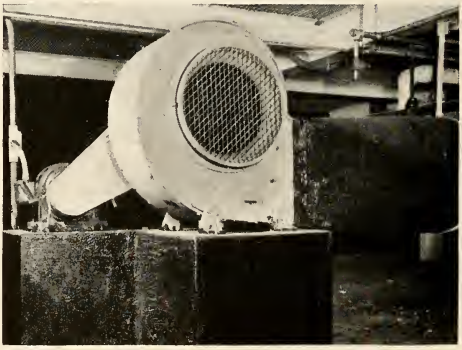


Tin tank with Udylite Rheostat, ventilated by supply and exhaust system using Ilg Blowers. Same system handles all plating tanks except chromium plating which operates with a separate Ilg Blower.

Two Ilg Blowers supply air to chromic acid anodizing, cleaner, sulphuric acid, potassium bichromate, and hot water rinse tanks.



Ilg Blower handles copper plate, tin plate and nickel plate tanks. Another Ilg Blower provides exhaust from stripping, dipping and plating tanks.



## NO "ENEMY AGENTS" HERE!

Scientifically designed to *swiftly, positively* remove toxic fumes from plating operations, this installation at famed Sperry Gyroscope Co. Inc. provides clean, healthful air conditions for employees, speeds vital war production. For quick, competent help on *any* air change problem, phone nearby Ilg Branch Office or write today!

**ILG ELECTRIC VENTILATING CO.**
2890 N. CRAWFORD AVENUE ★ CHICAGO, ILL.
Offices in 38 Principal Cities

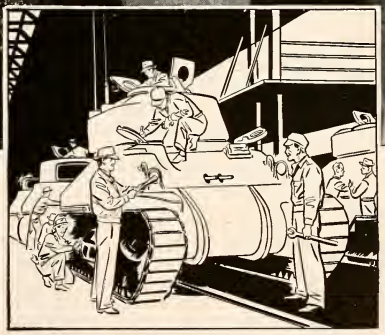
ARMY E NAVY

**ILG**

**VITALIZED VENTILATION**
AND AIR CONDITIONING
*AIR CHANGE...NOT JUST AIR MOVEMENT!*

# IT'S A WAR LOAD OF FIREPOWER





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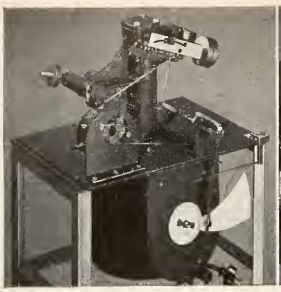
"SP" SUPERIOR PROCESSED COAL

Shaft mined from 5th and 6th veins, So. Illinois and 6th vein, Central Ill. district. Ash reduced at least a third by precision refining.

## PEABODY COAL COMPANY

**231 South La Salle Street, Chicago, Illinois**

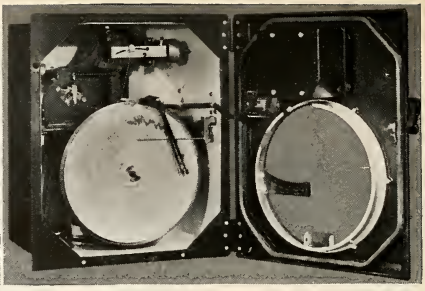
**BRANCHES: SPRINGFIELD - ST. LOUIS - OMAHA - MINNEAPOLIS - CINCINNATI - NEW YORK**



Meter assembled as one unit on rack ready for calibration.



Meter assembly can be easily removed from the case.



Meter with door open showing accessibility of all adjustments and working parts.

# Republic Boiler Meter

ON ONE CHART ○
STEAM FLOW
AIR FLOW
TEMPERATURE
OR PRESSURE

★ The new Republic Boiler Meter provides, in one instrument and on one chart, all the essential information concerning boiler performance regardless of the size or type of boiler, kind of fuel or method of firing.

The meter indicates, records, and integrates steam flow from the boiler and records rate of air flow for combustion. When the correct amount of air for maximum combustion efficiency is being supplied the air flow pen will record coincident with the steam flow pen, regardless of the load being carried by the boiler.

A third pen recording flue gas temperature (or steam pressure) can be added thereby providing the operator with complete information, on one 12-inch chart, relative to the performance of the boiler at any given time.

The Republic Boiler Meter consists of a standard Republic electric steam flow recorder and integrator and an oil sealed, bell type air flow element.

The air flow element consists of an oil sealed bell in a sealed chamber. The motion of the bell is transmitted through a diaphragm seal. This arrangement permits the use of a single bell—the high pressure being applied to the top of the bell and the low pressure under the bell. This arrangement also excludes air and dirt from the oil. The motion of the bell is transmitted to a cam system which extracts the square root, or when adjusted for a particular installation, compensates for chimney action and variable excess air requirements. The air flow pen is attached to the cam system with an adjustable linkage which permits changing the steam flow air flow ratio as conditions may require.

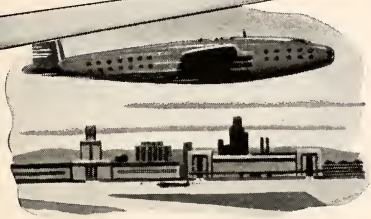


The entire operating mechanism is housed in a rugged steel case and can be easily removed as a single unit by merely loosening two anchor bolts and disconnecting the two air connections. The meter may be either wall mounted or flush mounted on a steel panel. *Write for Bulletin No. 420.*

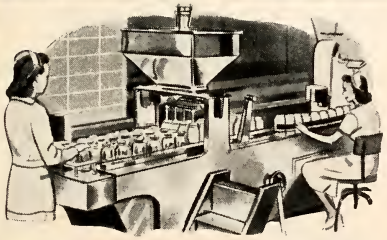
# REPUBLIC FLOW METERS CO.

## 2224 DIVERSEY PKWY. CHICAGO 47, ILLINOIS

# Filling Prescriptions with Steel!



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*Units of UCC do not make steel. They do make ferro-alloys used to purify and give special properties to steel. They also make non-ferrous alloys which, because of their exceptional resistance to wear, heat, and corrosion, are used as cutting tools, hard-facing welding rods, and for other purposes. UCC research and developments mean ever-new and improved alloys for industry . . . and ever-better products for you.*

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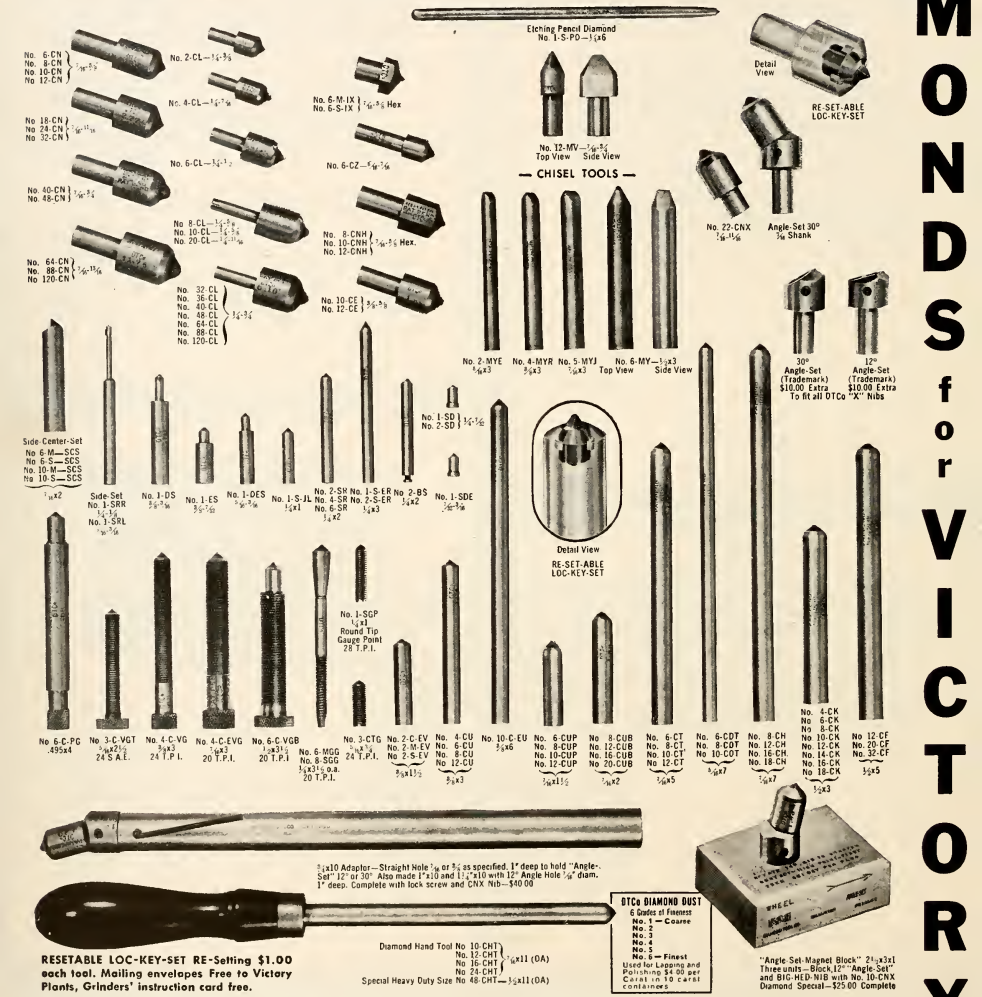
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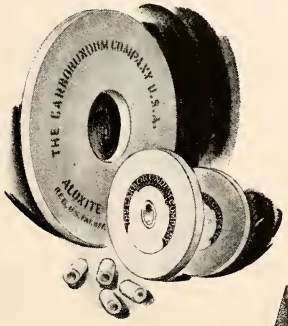
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So get this new family income plan working at once. Your local War Finance Committee will give you all the details of the new plan. Act today!



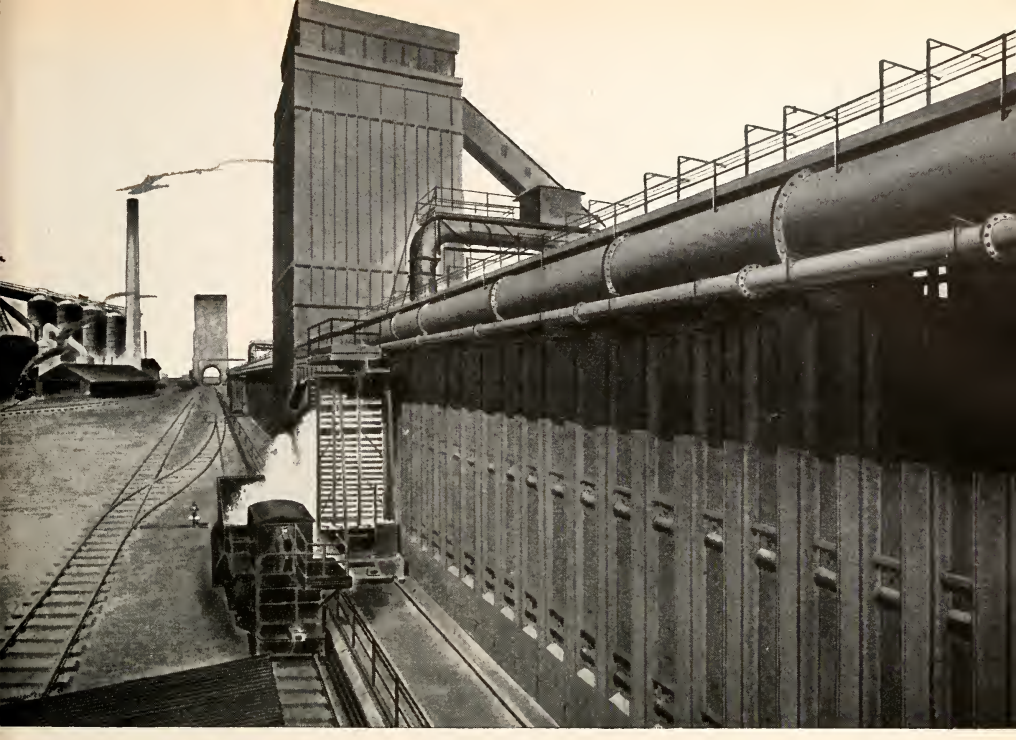
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This Space is a Contribution to America's All-Out War Effort by

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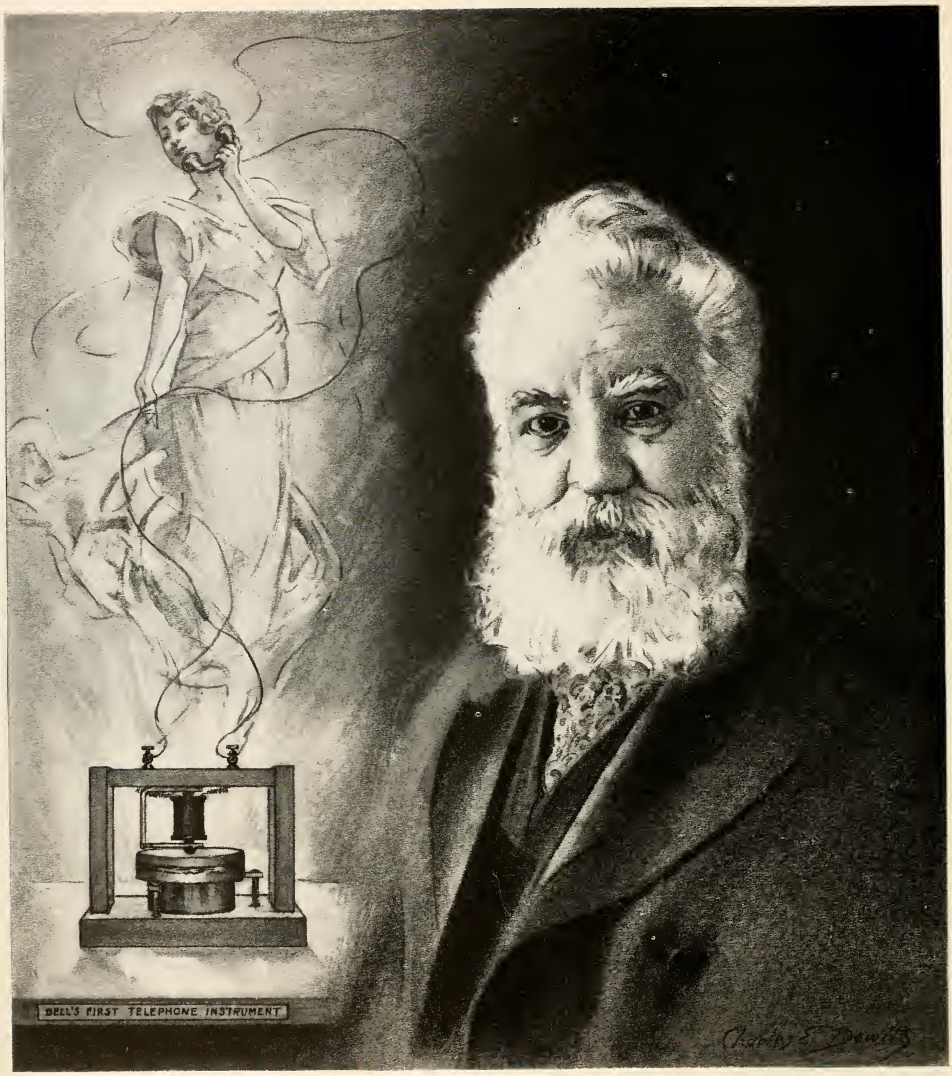
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Koppers is the largest builder of coke ovens. It is one of the principal producers and distillers of tar from which many of the chemical wonders stem. It is one of the first designers and builders of recovery plants from which come materials for use in plastics, synthetic rubber, paints, varnishes, dyes, solvents, motor fuel, disinfectants, medicines, flavors, explosives. One of Koppers affiliates is the nation's largest independent producer of bituminous coal.

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THE INDUSTRY THAT SERVES ALL INDUSTRY




Alexander Graham Bell "carried speech across the earth." His genius produced the telephone. This marvelous invention was due primarily to the benevolent aims of an inspired mind—the mind of a man who was interested in bringing to deaf-mutes a better means of communication with the rest of the world.

As a young man, Bell came to this country from his native Scotland, with deep interest in his father's system of instruction for the deaf and dumb. He himself was a master of accoustics, and believed that he could design a device which would enable the deaf to see speech by a series of trainings of voice vibrations. He did more—much more. He reproduced the human voice.

Bell's telephone was exhibited at the Centennial Exposition at Philadelphia. At first it was regarded as a toy. Soon its amazing probabilities were recognized, and it was given a most prominent place. Then, one hundred years after the Declaration of Independence, one observer, the Emperor of Brazil, was moved to say, with admiration and we hope also with reverence, "My God, it talks!"

CROWE NAME PLATE & MANUFACTURING COMPANY, Chicago

## Contributors

**Harry E. Barnard,** director of research for the National Chemurgic Council, served as Federal food administrator for Indiana during the first world war; he has drafted pure food laws which have been enacted by many states, and has been active in research and administrative duties relating to farm products and to public health.

**Arthur Howe Carpenter** is associate professor of metallurgy at Illinois Institute of Technology.

**Charles O. Harris** is associate professor of mechanics.

**Sanford B. Meech** is associate professor of English, and associate editor of the **Engineer and Alumnus.**

**Paul O. Ridings** is director of the News Bureau.

**Daniel Roesch** is professor of automotive engineering.

**John J. Schommer** is director of athletics, director of placement and professor of industrial chemistry. He is a special advisor to the selective service system.

**Clark E. Thorp** is a member of the chemical engineering research staff of the Armour Research Foundation.

**Arthur E. Wright** is executive secretary of the Alumni Association of Illinois Institute of Technology.

**John I. Yellott,** formerly director of the department of mechanical engineering, is chairman of the war training committee and director of the Institute of Gas Technology.

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**Cover Picture:** Courtesy of Westinghouse — A compressed air circuit breaker, under test in an industrial "igloo" at a temperature of 20 degrees below zero.


# ILLINOIS TECH ENGINEER AND ALUMNUS

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J. B. FINNEGAN, Editor SANFORD B. MEECH, Associate Editor

LUCILLE MYERS, Business Manager

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Alumni Section

ARTHUR H. JENS; HOWARD A. CARTER; Associate Editors

---

STUDENT STAFF

Norman W. Carey Ronald Lind

Raymond C. Gardner Bert Peterson

John G. Schwemberger



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# NEW INDUSTRIAL USES FOR FARM CROPS

By
HARRY E. BARNARD



In these strenuous and eventful days every new effort of industry and agriculture must be considered in relation to the war now going on in Europe and the Far East. Our role here in the Western hemisphere is being definitely cut out for us. We are no longer a new world set apart by broad oceans from old problems and their solutions. We have definite roles to play and we are earnestly training to take our parts.

We are now entering a new phase of chemical development—the chemurgic phase. And this brings a new word for our understanding and use. A few years ago there was no such word, but then, at Dearborn, Michigan, a group of farmers, industrialists, and scientists met to study the possibilities in expanding the market for farm crops for non-food uses. Out of their discussions grew the idea that there were many potential values in his crops which the farmer did not realize, as well as many new crops he might grow instead of corn, cotton, and wheat.

With the acceptance of this philosophy came the need for a name for the developing interest. The name was "chemurgy," and in the short years since the first chemurgic meeting was held the word has literally leaped into common use wherever farmers discuss the market for their crops, wherever chemists talk of the new research problems which are coming to their laboratories, wherever industrialists plan the development of new products or the expansion of their plants to meet the requirements of improved technology and the demands of customers eagerly waiting for new things. The word defines itself, for it combines the ancient roots "chem," or chemistry, and "ergon" or work, to give us chemurgy—chemistry at work.

Chemurgy is then the application of chemistry in industry, with special attention to the use of the annual crops from the land in markets essentially new and different from those heretofore provided by the need for food for the human family, feed for domestic animals and textiles for clothing and family use.

Farm chemurgy is the application of the science of chemistry to the industrial use of farm crops just as metallurgy is the application of science to the industrial use of metals. Chemurgy may well change our entire agricultural outlook and provide the key to the gateway to prosperity which we are all groping for. Chemurgy presents the vision of America making full use of her different soils and climates, utilizing every product of her farms and byproducts of agriculture so that the packers will not be the only ones to claim, with justice, that every part of the hog is utilized except the squeal. It involves a change in our psychology in regard to food crops. In the face of the scarcity, destitution, and even famine which have dogged man's footsteps throughout history and which still exist, it seems at first sight almost criminal to turn food crops into houses, roads, and fuel for motors. Yet such is the abundance which can be produced in this country that it is inconceivable that even in these war times all the products of our farms can possibly be used as food.

During the past twenty years, farmers have worked under the restraint of a restricted, deflated market for goods. In 1920 the loss of foreign markets began to cause farm products, for which there had been an unlimited demand during the war, to pile up in our centers of distribution. It soon was evident that efficiency in production was to be the keynote for those farmers who were to survive the oncoming deflation of the prosperity of 1920.

But efficiency, when you individualize it and apply it to each separate farmer and farm operation, necessitates the best known methods of production, the best seed of the best varieties, better, more efficient livestock, the avoidance of crop failures, good crops, good pastures, and the control of disease and insect pests. It must be clear to anyone that the acceptance of these factors of success in agriculture must inevitably continue to cause two blades of grass to grow where only one grew before, whether we like it or not. The imperative need is to find use for the second blade of grass.

For several generations the Agricultural Experiment Stations have cooperated with the farmer in the development of improved methods. During these years his crops have remained essentially unchanged, but production methods are now greatly different. The farm production of power has undergone a revolutionary change. As late as 1920, farm power in terms of horses or mules was produced by 25,000,000 hay- and corn-burning units. Today only about half as many such units are required, for internal combustion

engines, using power obtained from crude oil, are doing the work. Along with the decrease of more than 10,000,000 farm-feed power-plants has gone the demand for the products of the 50,000,000 acres which once furnished the fuel. And while these acres have been taken out of production, mechanized farm equipment, such as improved tools for plowing the land, cultivating the crops, and handling the harvest, have greatly increased the production of starches and sugars and cellulose crops the world over. This, in good crop years, has piled up huge world surpluses and, coupled with our efforts to maintain prices, and with world commerce interrupted by the war, has steadily closed our export markets.

We admit also that the chemist has contributed to this dislocation of agricultural practice. Cellulose products, cotton, and woods, for instance, have received his particular attention.

The cotton farmer thinks of these new chemical products as direct competitors of his crop. This is only partly true, for an enormous tonnage of cotton goes to the plastic mills for conversion into rayon, cellophane, and the great variety of new synthetic fiber and sheet materials, to say nothing of the nitration of cotton for explosives. The loss of export trade in cotton is far more serious, for a world market cheaply supplied from the new cotton acres in Brazil, India, China, Abyssinia and elsewhere will undoubtedly have no future need for American cotton except at a closely competitive price.

What is true of the cotton crop is to a less degree true of many other crops.

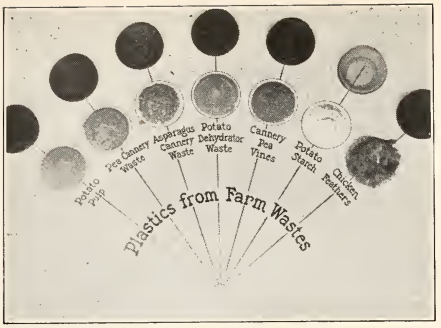
It is these changes in the market for farm crops which prompted the organization of the chemurgic movement—a movement intended through the emphasis placed on the industrial use of farm crops to offer the farmer, not a panacea for his temporary ills, but a practical and permanent cure. Instead of continuing to find ways by which to make two blades of grass or two ears of corn grow where one grew before, it should be, as indeed it is, the desire of the state experiment stations and research workers everywhere to find two new uses for the old crop and two new crops to replace each old and useless one.

While the chemurgic movement as an organized effort is but eight years old, the ideas it is fostering are not new. They are as old as chemistry and industry. Two hundred years ago potatoes and corn were being used, not as food, but for the production of starch with which to stiffen our linens and laces. Sugars, in the form of molasses from the Sugar Islands in the West Indies and fructose in apple juice, went into consumption as New England rum and hard cider. And many years ago ingenious Yankees were making nutmegs from wood and pressing milk casein into buttons.

But when the chemist entered industry he began to draw more heavily year after year upon the starch and proteins and cellulose and oils in the farmers annual crops for his raw materials; he began to break up nature's big molecules and to reform them for new uses.

Eastern Regional Research Laboratory
Philadelphia






*Photo—The Chemurgic Digest*

Waste materials from the farms of Idaho are the basis of experiments in plastics being conducted by the Idaho Farm Chemurgic Committee with the assistance of the College of Idaho department of chemistry. This picture shows samples of the materials and plastic dishes made from them.

We have always thought of our crops of corn in terms of their value for food for our families and feed for animals. The cotton crop has been valued as our most important export, and as a raw material to be spun and woven in our textile mills. But chemists back of the chemurgic movement do not think of corn as something to be manufactured into pork and dairy products. They think of the thirty pounds of starch in every bushel of corn as a raw material for the chemical industry to convert into innumerable important products, and they think of cotton not as a fiber, but as a pure form of cellulose, a chemical raw material. They think of wood not in terms of board and plank and dimension stuff stored in lumber yards, but as the cheapest form of cellulose, to be converted into pulp for the making of paper or into the plastics which are rapidly becoming among the most important of our chemical products. They think of oranges and grapefruit in terms of their content of organic acids, of pectin and oil and cellulose; of sweet potatoes as cheap sources of valuable starch. Indeed, to the chemist all annual crops may be broken down into three great chemurgic classes, namely, carbohydrates in the forms of starch and sugars, cellulose in the form of vegetable fibers of every description, and protein, the nitrogenous content gathered into the plant structure from the air and the soil by the living cell.

To the chemist there is nothing difficult or surprising in these transformations. The silk worm converts mulberry leaves into silk. The sheep has a way of digesting woody fiber and making it into wool. The cow converts grass into milk, rich in oil and protein. And the research chemist can do the same thing, using to a large degree the same chemical and biological processes the animal employs. It may not be practical today to go into the chemical laboratory for our wool or silk or dairy products, and I use these illustrations only to support the statement on the corner stone of the chemical laboratory at Texas Agricultural and Mechanic Arts College, "The secret of all who make discoveries is to look upon nothing as impossible."

In a recent editorial, Wheeler McMillen, president of the National Farm Chemurgic Council, pointed out that the need for American sources of every essential raw material has clearly been demonstrated in the years since the opening of the war. Manufacturers in the United States, dependent upon foreign supplies of several vegetable oils, crude drugs and other important agricultural materials, already have felt the pinch of price increases and shortages and are finding here at home most of the supplies they need.

There is no need for the United States to suffer scarcity of any product of the soil. This country has nearly every possible combination of soil, temperature, humidity and altitude, plus an enormous scientific capacity to transmute plant substance into commercial products.

The United States has reached the position of the largest consumer of animal and vegetable fats in the world. The manufacturers of industrial products and food products in which oils and fats are used have created outstanding domestic industries. Yet these industries have been dependent upon imported raw materials to a greater extent than any other domestic industry of comparable size, with the single exception of the rubber industry. Fats, oils, and oil seeds, are chiefly agricultural products. We have the land and the labor for producing them. Our dependence on imports has created one of the wide gaps in a national defense program.

To correct the inadequacy of our present domestic supply we have doubled the acreage in peanuts, tripled the yield of soy beans, greatly increased the production of corn oil, maintained the 1937 acreage of cotton without reduction, and increased by twenty-five percent the production of tallow and grease. This in round numbers increases the annual production of fats and oils in the United States by 1,600,000,000 pounds. But this is not all. Many new crops can be grown,—crops of sesame, perilla, hemp, flax, and sunflower seed. We actually need today an increase of two billion pounds per year in our domestic oil production in order to be safely self-sufficient; able to withstand a Pacific coast blockade; able to keep at home and in circulation the enormous sum of hard American dollars we have heretofore paid to the producers of fats and oils in Japan, China, the Philippine Islands, Argentine, the British and Dutch tropical colonies.

Although the war has given the cotton farmer temporary markets, cotton faces a situation which cannot be cured. The foreign market, which has through the years used a large part of the crop, is now largely supplied by cotton grown on cheap lands and by cheaper labor. And added to the threat of cheap cotton are the difficulties of producing crops in competition with pests and disease. There may, however, be an answer or at least a partial answer to the difficulties confronting the cotton farmer and the cottonseed oil processor, and that is the growing of a new crop—the soybean crop. This crop is not a cellulose crop: it is an oil and protein crop which will furnish the $200,000,000 invested in cottonseed oil processing plants a job to do and supply the much needed oil now imported. The growth of the soybean industry is astonishing, both in terms of the acreage devoted to it and in the

new uses which are being found for it. The total acreage in the United States harvested for seed in 1933 was 997,000, while in 1942, ten years later the seed crop was more than 200,000,000 bushels and ranked close to corn in many states.

No crop lends itself so readily to industrial use, for both its oil and its protein content admirably fit many industrial requirements. Soybeans are used in making paint, enamel, varnish, glue, printing ink, rubber substitutes, linoleum, insecticides, plastics glycerin, and an increasing number of industrial products. One of the greatest automobile companies used hundreds of thousands of bushels of soybeans each year in painting its cars, in its foundries, and in many small plastic parts, and has developed a spinnable soybean fiber which is mixed with wool for carpeting and upholstery. Indeed, when we can turn from war to domestic production we are promised automobile bodies made in part from soybean plastics, bodies which will be much lighter than the present steel bodies, tough and dent proof though yielding.

Artificial leather contains its proportion of soybean oil; celluloid, glues and cements, glycerin, linoleum, oil cloth, printer's ink, rubber substitutes, varnishes are in whole or in part made from soybean products. When we consider the fact that forty percent of the weight of the more than two hundred million bushels of soybeans which were harvested this year was in the form of protein, or as it is frequently called, casein, because of its close resemblance to milk casein, the possibilities in the industrial utilization of this enormous tonnage of a very valuable basic material produced directly from the beans instead of milk casein resulting from the metabolic processes of the cow are very great. When chemists and industrialists study the physical and chemical qualities of soybean proteins as thoroughly as they have studied the values inherent in coal tar we may well find that a score of new industries have been built out of the chemical components of this new crop.

Each year about fifty billion quarts of milk flow into the nation's milk pails. About forty-two and one-half percent of this supply is used as fresh milk or cream either in city or farm homes. Another forty-one percent is used for making farm or factory butter.

When fresh milk goes into a bottle, or into a powdering or condensing process, that's that. The entire quantity is disposed of. But when milk goes to the butter or cream manufacturer, his main interest is in only one part of that milk—the butterfat. When he runs a hundred quarts of milk through a cream separator, he ends up with roughly four quarts of cream which he can use in his operations, and ninety-six quarts of skim milk which he cannot use.

We use more than three billion quarts of milk to make the seven hundred billion pounds of cheese we eat every year and that leaves on our hand almost three billion quarts of cheese whey. To further complicate the picture, the dairy industry has a waste product which has a waste product! For if we take skim milk and extract its casein content we come out with casein at one end and a flood of whey—more than a billion quarts of it—at the other. We have twenty-five billion quarts of skim milk, one and one-third billion quarts of buttermilk, now largely wasted at the creameries, three billion quarts of cheese whey, one billion quarts of casein whey; a grand total of over thirty billion quarts of liquids—in terms of volume about three times the size of the nation's barley harvest annually, in excess of the entire 1939 wheat crop, almost one-third as large as the country's corn yield.

What is being done to convert this huge waste into added income for the dairy farmer? Government and private research in the field of milk by-product utilization is of comparatively recent origin. However, substantial progress has been made both by the government—for the Bureau of Dairy Industry has accomplished much despite its limited budget—and by private interests. For instance, skim milk and buttermilk use has shown almost a six-fold growth since 1920. And it may be that new uses for skim milk will soon be found. We are already making excellent paint from milk casein, and recovering lactose or milk sugar which has many industrial uses. We are saving the lactic acid and using it as a basic material for a long line of so-called salts for pharmaceutical and industrial uses. Perhaps the most interesting new use for skim milk is a spinnable fiber, or artificial wool. It resembles wool in composition and appearance and has many practical values which will no doubt stimulate its production in our dairy states. It is now being made commercially and woven into fabrics and felted into hats.

The average American family consumes every year more than half a ton of paper in the form of newspapers, books, writing paper, cartons, building boards, wrapping papers, and miscellaneous products. A new use for paper is rapidly developing. That is in the paper milk-bottle. Hundreds of millions of such bottles now carry the milk supply into the homes of New York and nearby cities. These bottles meet every sanitary and physical requirement, and once used they are discarded. If, instead of glass, paper were generally adopted as a milk container, every family would use each year many more pounds of paper than it uses today. It has been estimated that the shift from glass, made from

(Turn to page 46)




Pulleys, ash trays and automobile license plates are among the items which can be manufactured from potato pulp plastics.

*Photo—The Chemurgic Digest*

# GENERAL SEMANTICS AT ILLINOIS TECH

By
SANFORD B. MEECH

General Semantics is one of a number of modern schools of sematic thought which differ rather widely both in theory and in methodology. It has its devoted adherents and its ardent critics, all of whom, however, agree on the importance of the problems of human behavior with which it deals. The interest in these problems which it has provoked, not only among linguistic scholars and psychologists but also in the public in general, can only lead to the enlargement of the field of knowledge and to the consequent advantage of all of us.

Semantics is, of course, the science of meaning—that branch of learning which is concerned with the entire process of the communication of thought. Its province is obviously a wide one. It has to do with all the languages ever devised by man and with all aspects of them—the spoken and written, the elevated and colloquial, the general and specialized. It has to do also with non-verbal symbols and symbolic systems—with gestures as well as with speech, with fire sirens and stoplights just as much as with the words "Fire," "Stop," and "Go," with the policeman's uniform or the Brooks Brothers suit as with such phrases as the "majesty of the law," or "a man of good family," and with the Gothic cathedral which houses the library of Prairie University as with slogans like "The Great Tradition" or "The Heritage of European Civilization."

Naturally enough, the primary concern is with communication by verbal symbols—by words, that is—since this is the most used, the most complex, and the most efficient method of conveying ideas which has ever been developed by human beings. And in this field of verbal communication, there is ample room for investigation by all the semanticists of this generation and of many to follow it.

There are two main approaches to the study of language—the historical and the psychological. They are naturally complementary. No historical semanticist can totally eschew psychological assumptions in his work, and no psychological semanticist can afford to ignore the phenomena of linguistic change which has historically minded colleague has discovered for him.

The semantic historian records the meanings of words at particular periods or the changes in signification of words from period to period. He may trace the semantic development of a very old Aryan word like *father* from its earliest occurrence in the form *pitr* in Sanskrit of the second millenium before Christ to its contemporary use by a Mexican Indian who calls his priest *padre,* by Herr Goebbels who exalts his *Vaterland* for his devious purposes, or by an American geneticist who refers with scientific detachment to this or that *father* animal. Or the student of language may devote his attention to an expression of less venerable antiquity—for example, *G. I.* These letters originally designated army equipment of general issue. They then came to be applied to their recipient, the American private soldier. In this application they meant "ordinary" or "average." A *G. I.* private was and is just Johnny Doughboy incarnate. Now they are used of commissioned officers, even of four-star generals, in the sense of "fair and square," or "understanding," or, as the French would say, *sympatique.* A *G. I.* lieutenant is a leader but not a martinet—in short a "regular guy." The most useful product of historical semantics is a dictionary of a language as it has developed over a period of time. The outstanding example is the New English Dictionary, commonly called the Oxford Dictionary, which records the meanings of English words as they have been used from the seventh to the twentieth century.

The psychological semanticist tries to explain the processes involved in the communication of ideas. Whereas the historical semanticist concentrates upon the verbal symbols employed for it, he directs his attention to the physiological or psychological mechanisms which make it possible for the speaker or writer to use and for the hearer or reader to be affected by them.

He may attempt to describe what goes on in communication in various ways. If he is a logician, he will evolve a systematic description of the process of thinking in humankind by generalizing on the verbal patterns in which a larger or smaller group of people is accustomed to express its ideas. If he is a physiologist, he will tell us about chemical and electrical changes which take place in the nervous systems of individuals while they are engaged in the communicative process. If he is sociologically minded, he will study the effects of language and other symbolic communication upon the behavior of individuals at particular junctures as well as upon their general orientation.

Those who espouse what they call General Semantics are interested in the psychological aspects of their science rather than in the purely historical ones, although they are, of course, not indifferent to the very real aid which the historical semanticists can give them. They are strongly opposed to the logician's approach to linguistic phenomena on the ground that it is purely verbal and, as such, incomplete and misleading. They deplore the influence on modern thinking of the ancient Greek philosopher Aristotle, whom they regard as the most influential proponent of this approach. They as strongly espouse the physiological and behavioristic approaches.

At present, they are concentrating upon the latter.

The moving spirit in this school of semantic thought is Count Alfred Korzybski, once an officer in the Russian Imperial Army. His first-hand observation of the cataclysm of the first World War and of the upheavals which followed it led him to speculate upon the basic causes of the general dislocation of human affairs. He came to believe that a major one was the imperfect understanding of symbolic processes, which resulted in the creation of such unnecessary barriers to human cooperation as racial, national, and class prejudices.

After a lengthy period of study, he began to expound his theories about the semantic aspects of human behavior both in books and articles and on the lecture platform. The most complete statement of his ideas is to be found in his book, *Science and Sanity,* first published in 1933.

In 1938, the Institute of General Semantics was incorporated as an educational institution with Korzybski as Director, and it has been functioning ever since as a center for teaching, research, and publication in the field delimited by the Count. Its quarters are at 1234 East 56th Street, Chicago 37.

Two "American Congresses on General Semantics" have been held, the first at the Central Washington College of Education at Ellensburg, Washington, in 1935, and the second at the University of Denver in 1941. Eighty of the papers which were read at Denver have been printed in a fat volume entitled *Papers from the Second American Congress on General Semantics.* The wide range of subject matter in this volume is indicative of the catholicity of interests of the exponents of general semantics. It is divided into two books, the one entitled "General Introductory to Non-Aristotelian Orientation and the Methodology with Related Subjects," the other, "Human Adjustment, Methodological Foundations for Neuro-Semantic and Neuro-Linguistic Integration of Personal and Social Life in our Time." Book II is divided into four parts, respectively entitled "Neuro-Semantic and Neuro-Linguistic Factors in Medical Science and Practice, Neuropsychiatry, and Related Specialties," "Mental Hygiene Aspects of Individual and Public Psycho-Logical Adjustments," "Some Neuro-Semantic and Neuro-Linguistic Factors in the Re-Construction of Education," and "Some Non-Aristotelian Considerations."

Among those who have done much to publicize General Semantics is Dr. S. I. Hayakawa, Associate Professor of English at Illinois Institute. He has been explaining its principles to our students since he came to us in the Fall of 1939, and he has also been interpreting them to a nationwide audience in lectures and magazine articles, and most notably in his best seller, *Language in Action.*

This book is the product of his experience in teaching semantics to English classes at the University of Wisconsin and at Illinois Institute. In its preliminary form reproduced by the offset process it was used as a basic textbook for all our classes in the first semester of Freshman English in 1939, 1940, and 1941. A number of institutions of higher learning followed our lead in adopting it as a medium for the teaching of English.

It was accepted for publication by Harcourt Brace in 1941 and in the same year was chosen by the Book-of-the-Month Club for distribution among its hundreds of thousands of members. It thus became required reading for the public as well as for our engineering students.

This book of Professor Hayakawa's is not a grammar. It does not tell you when to use *shall* and when *will,* when *like* and when *as,* or whether *data* takes a plural or a singular verb. He disregards such matters, not because he considers them unimportant, but because he is satisfied that they are well taken care of by the scores of grammars which flood the market for college textbooks.

The purpose of his book is to teach one how to listen and read more critically and more understandingly and to write more clearly, honestly, and effectively. It strives to achieve this purpose by explaining in simple terms the main factors involved in the business of communication between members of the human family.

This method was adopted on the universally accepted principle that anyone can better cope with a mechanism if he understands something about its mode of functioning. A chauffer who is a qualified mechanic will get more out of a car and make it last longer than one who is not, however much experience the latter may have had in driving. And the pedestrian who knows about cars will have a much better chance of getting across the street safely than one who does not. The speaker or writer who knows even a little about the psychology of language should be able to convey his thoughts more exactly and to greater effect than one who proceeds by authoritarian rules of style and rhetoric or who relies entirely on what he calls "inspiration." And the reader of our numberless books, magazines, and newspapers should be helped by such knowledge in understanding and evaluating what he reads.

The essential principle of Dr. Hayakawa's teaching is that of non-identity. No two things, he says, are ever exactly the same. The most precise modern machinery cannot turn out products which are absolutely identical. Even what we regard as one and the same object is not really so in consecutive seconds. The page on which these words are printed changes from moment to moment, although you cannot see that it does without the aid of an electron microscope.

This principle as applied to language means that a word is not the same as the object or person which it denotes and that no word ever means exactly the same thing twice. The name Joseph Rabinowitz, for example, is not the individual designated by it, who is not only a member of a particular family but also a biological specimen, a successful merchant, a citizen of the United States, and an infinity of other things. The generic term *Jew* when applied to Mr. Rabinowitz, who is rich, politically conservative, and Orthodox cannot mean the same thing as it does when applied to Mr. Samuel Cohen, who happens to be poor and a member of the Communist Party and who detests the Synagogue and all its works. The name Samuel Cohen which identifies this radical individual of today will certainly denote a very different fellow twenty years from now, whether he has acquired a long police record in the meantime or has become as socially respectable as Rabinowitz.

As members of society, we cannot avoid passing judgments on the Rabinowitzes, Cohens, Rileys, Swansons, and Jones which constitute it or on the programs of the Republican and Democratic Parties, "governmental regimentation" versus "free enterprise," and an infinity of other issues. At best, judgments on human affairs are hard to make. The general semanticist asks us not to confuse the issues unnecessarily by taking words for things.

That words are not what they designate and that no word ever means quite the same thing twice are statements which seem ridiculously obvious, but they are not so easy to put to use as they might appear to be. A man may resolve not to be prejudiced for or against individuals and causes by the labels given to them by patently biased people but on the contrary to judge these persons and issues on the basis of his knowledge of the facts about them. And he may also resolve to speak and write about them with

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# PHYSICAL PROPERTIES OF RUBBER COMPOUNDS

By

CHARLES O. HARRIS

Such a versatile material as rubber has many aspects, each capable of exciting the imagination of the scientist. One interesting aspect is the array of physical properties. In most of its uses, rubber must withstand force, and, where it does, its physical properties are of practical significance. This is not to say that other characteristics, such as the chemical, electrical, economic, and agricultural are not important. However, they are beyond the scope of this article. An idea of the breadth of the science of rubber can be gained from the facts that one eminent book in the field, *Science of Rubber,* published in 1930, was edited by Memmler, but that in actual writing he was assisted by seven collaborators. The English translation of this book was edited by two men in collaboration with ten others. Another work by Davis and Blake, *Technology of Rubber,* published in 1937, had thirty-nine contributors. No one person could hope to be familiar with more than a small branch of the field. One who is interested in the physical properties finds there more than enough for a lifetime of study.

Work on the physical properties begins after vulcanization of the rubber compound. In the case of natural rubber, the latex, obtained from the tree or plant, is coagulated, then compounded with various ingredients—fillers, accelerators, softeners, antioxidants, plasticizers, etc. Some of these, such as pine tar oil, suggest that the rubber chemists once worked for patent medicine manufacturers. After compounding, the rubber is vulcanized by being subjected to heat and pressure.

Synthetic rubber, which has assumed tremendous importance in recent years, can be produced in a soft, solid state and is then compounded and vulcanized. Synthetic rubber has had its ups and downs. It developed very rapidly in Germany during the first World War, to such an extent that Memmler states, "It is no longer a secret that shortly before the end of the war it was firmly believed that the emergency of tire requirements for German military vehicles had been mastered." After the war, the high cost led to abandonment of industrial manufacture, and in 1927 Rosenbaum, in the preface to his translation of Gottlob's *Technology of Rubber,* wrote, "Synthetic rubber is to all intents and purposes dead, although the Soviet government is offering prizes for a successful artificial rubber, and it is rumored that the I. G. Farbenindustrie A-G is again taking a practical interest in the matter."

Physical properties are properties determined from physical tests and are commonly thought of as those which relate to the use of a material under stress and strain; properties such as strength, stiffness, hardness, resilience and fatigue characteristics. These are the same properties which are important in the use of steel and other common materials of engineering; yet the properties of rubber differ so much, both qualitatively and quantitatively, from those of the metals that different equipment and methods are required for their measurement. As an example, it has been the author's experience in using a universal testing machine in tests of soft rubber cylinders in compression, that the specimen may act as a spring set into the weighing mechanism so as to cause the beam to vibrate through an annoyingly large number of cycles before coming to rest so that it can be determined whether it is in balance. Again, few standard testing machines are designed for the testing of a specimen in which the maximum load does not exceed 100 pounds.

One of the first questions that arises in the use of a material is: How strong is it and how does it deform under load? This may be answered by loading it until it fails and by measuring deformation. Measurements taken at intermediate stages of the test furnish information for plotting a stress-strain curve, but the curve for any rubber compound is quite different from that for any of the metals. This is seen clearly in Fig. 2 which shows stress-strain curves for six natural rubber compounds in tension. Curves like these are obtained after loading and unloading the specimens several times. The curve changes in shape after each of the first few cycles, and those in Fig. 2 represent the attainment of a condition such that succeeding loadings would give approximately the same result. Notable here is the large elongation which can be applied (compared, for instance, with mild steel in which the elongation at failure will rarely exceed thirty-five per cent). Also, it is evident that stress is not proportional to strain, even for very low stresses. Most of the common formulas for stress and deflection are based upon proportionality of stress to strain and hence cannot give true results when applied to rubber. Besides, many of these formulas assume that deformations are very small and would give misleading results for the large deformations to which rubber is subjected in practice.

So far the standard textbooks on strength of materials have not covered the properties of rubber. This condition will no doubt change in the future, and when it does it may cause other changes as well. For instance, many writers make little distinction between elastic limit and proportional limit, in fact go so far as to use these terms interchangeably. This has slight consequence in discussing the properties of structural steel since

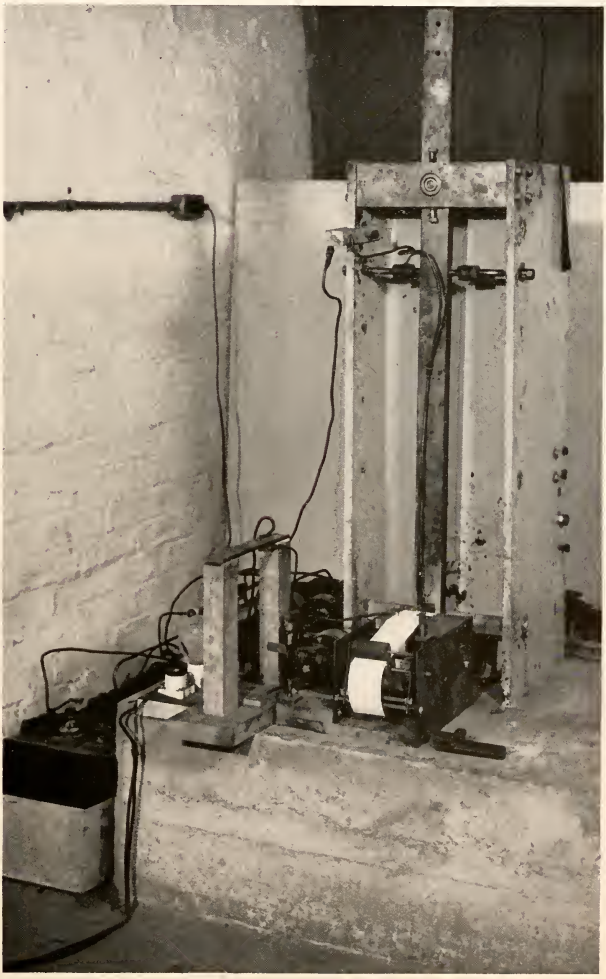
the two quantities are practically identical for this material. By definition, however, they are quite different, the elastic limit being the stress beyond which permanent set will occur and the proportional limit being the stress beyond which unit stress is not proportional to unit strain. In speaking of rubber, the two terms must be used correctly because the proportional limit occurs practically at zero stress and the elastic limit practically at the ultimate strength.

It has been common to divide materials into two classes, those which are ductile and those which are brittle. A ductile material is one which can be subjected to large deformations. A brittle material is one which will show very little deformation, even when loaded to failure. According to this, rubber is probably one of the most ductile of all materials. Yet if one looks beyond the definition of ductility and inquires into its real significance, it becomes apparent that the ductility of rubber is of an entirely different type from that of steel. In general, the ductile metals have well defined yield points. Deformation under load occurs after the elastic limit has been exceeded and is plastic, rather than elastic, deformation. The proportional limit has also been exceeded, and, with stress no longer proportional to strain, the distribution of stress tends to equalize, so that an originally unsatisfactory stress distribution is replaced by a more favorable one instead of causing failure. This is one of the most important reasons for specifying ductility in a metal. The deformation of rubber is elastic deformation. Stress is not proportional to strain, but the stress-strain curve has no abrupt change in slope and the ductility is not directly beneficial in modifying an unsatisfactory distribution of stress. Occasionally, extreme ductility, even of an elastic nature, may have indirect benefit from the point of view of stress concentrations. Every engineer knows that there is a stress concentration at the edge of a hole or other discontinuity. For instance, the stress at the edge of the circular hole in the plate in Fig. 3a is three times the average stress S. Under large deformation the shape of the hole changes to something like that in Fig. 3b. Now theory shows (and this theory is supported by experimental evidence) that the stress concentration is small for the shape of hole in Fig. 3b. Thus, in the large deformation, the stress concentration is largely removed by changing the shape of the member. On the other hand, there are cases in which this extreme ductility, unaccompanied by large changes in the stress strain relation, may, by changing the shape, lead to a worse stress condition than the original one. The difficulty encountered in trying to apply the ductile-brittle classification to rubber shows the impossibility of trying to use the conventional standards for measuring its physical properties. Rubber differs so much from the familiar load-carrying materials that new methods and standards must be developed in order to evaluate it and use it efficiently. Some people have done work of this type but enough remains to provide an interesting field of research.

Rubber is not strong compared with the metals. The strength of rubber

Fig.1 Equipment used at Illinois Tech for dynamic tests of rubber.

*Photo—Visual Education Dept.*

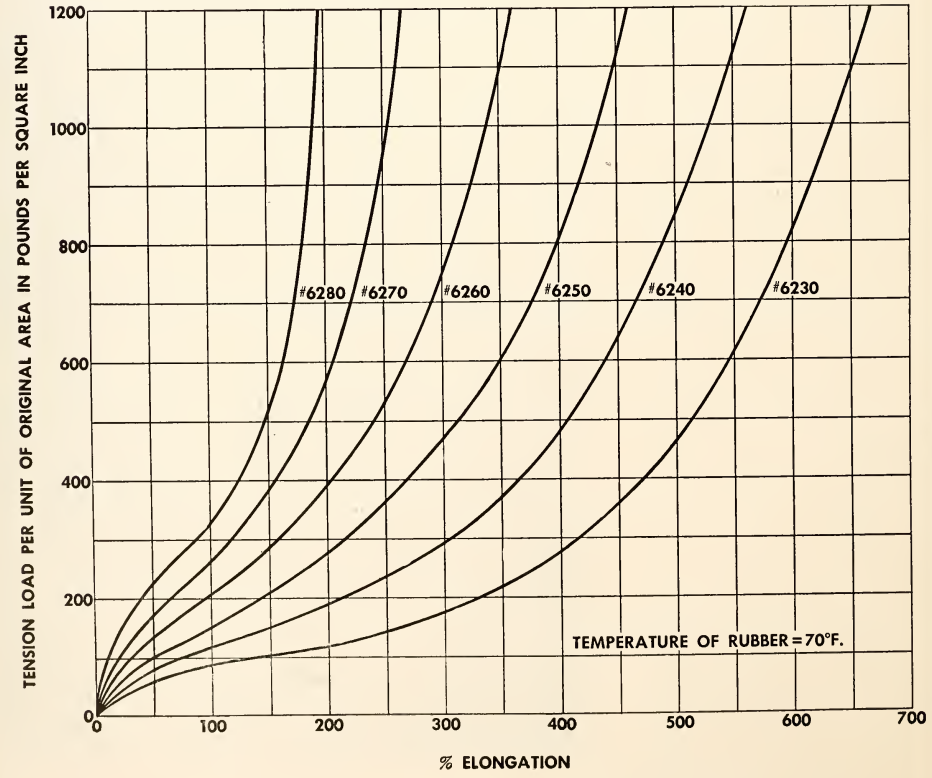


in tension is ordinarily stated in hundreds of pounds per square inch, whereas that of a metal is usually given in thousands of pounds per square inch. Yet, for energy-loading rubber far surpasses any of the metals. The reason, of course, is the large extension to which rubber can be subjected. The energy which a unit volume of material contains under load is approximately equal to one-half the product of the unit stress and the unit strain, this being equal to the amount of work done in stressing it. Steel, under a unit stress of 15,000 lb. per square inch and an accompanying unit strain of 0.0005, contains 3.75 inch-pounds of energy per cubic inch. A soft rubber stock, under a unit stress of 300 lb. per square inch and unit strain of 4, contains about 600 inch-pounds per cubic inch, enough in one cubic inch to lift a 150-lb. man a height of four inches. This shows why rubber is a useful material for automobile tires. The energy involved in striking a bump can be absorbed by the rubber in the tires rather than in stressing the frame of the car and bouncing the passengers.

One important use of rubber results from the fact that it does not give up all of its energy when the load is removed, but, under certain conditions, may return as little as ten per cent of the total. The energy lost, or dissipated, is usually called hysteresis and is probably due to internal friction between layers of the rubber. The fact that so much of the energy is lost makes rubber useful as mountings or springs for supporting motors, where it can be very effective in preventing or isolating vibration. Everyone familiar with vibration theory knows that large amplitudes of motion result in a vibration at resonance because the exciting force does so much work upon the system. This work is stored in the system as energy and alternates from potential energy to kinetic energy. After a few cycles, the amount of energy contained in the system is so great that the oscillation becomes violent. If the springs of the system are of a properly selected rubber compound, however, the rubber will absorb so much of the energy that the amplitude will remain small. In

Fig. 2 Stress-strain curves for six natural rubber compounds in tension.

*Courtesy U. S. Rubber Co.*



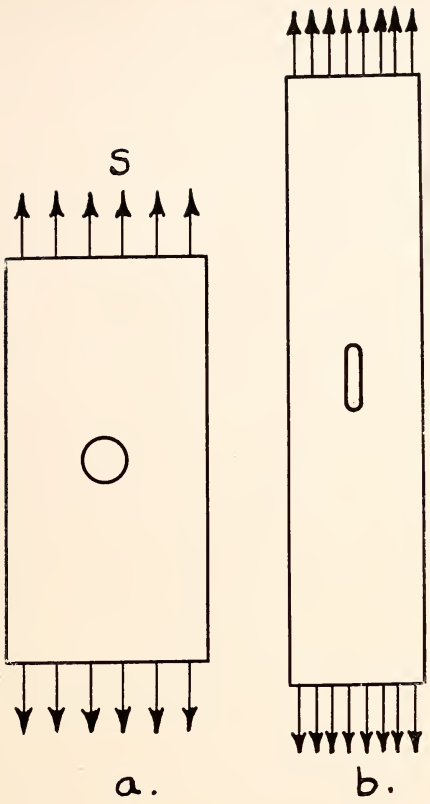



Fig. 3 Effect of extreme elongation on shape of hole in rubber sheet.



Fig. 4 Rubber cylinder compressed to 75 percent of originial length.

order to predict just how small in a given case, it is necessary to know how much energy the rubber will dissipate. This is a definite physical property of the rubber and can be specified as the ratio of the energy dissipated in a cycle of stress to the energy input. Another way of specifying the loss (and a preferable one from the point of view of the engineer) is to state the force which does the negative work on the system. This is usually assumed to be a force proportional to the velocity of the spring-supported mass; such a force is known as a viscous force, and the whole phenomenon carries the name of viscous damping. The reason for assuming that viscous damping occurs is that the differential equation describing vibration with viscous damping has a well-known solution and this solution can be used, not only in evaluating the damping, but also in applying the results to a design problem. It is true that the results of any single test can be expressed satisfactorily as viscous damping, that is, that a constant can be found which expresses the ratio between the damping force and the velocity of the spring-supported mass. However, the results of a series of tests at different frequencies show that the "constant" just referred to is not a constant but varies with the frequency. Further investigation shows that it varies with other factors also, and so one is led to expression of the damping by means of a "variable constant," a device of practical value to the engineer but of questionable merit in the mind of the investigator. Even when it is known that the damping is not viscous, it will be extremely difficult to find just what it is, unless and until the solutions of certain non-linear differential equations are at hand. Given these solutions it may well be that the value of rubber as a material for springs will be shown to depend more upon the fact that stress is not proportional to strain than upon its damping capacity.

The question of damping and other physical properties has been so interesting to some of us at Illinois Tech that a small laboratory has been established in the basement of Chapin Hall where measurements can be made. The principal piece of equipment is that shown in Fig. 1. This is home-made and consists of a rolled-steel column-section set in a block of concrete. Crossbars between the flanges of the column contain bearings supporting the pendulum in the center. Two rubber springs, one on each side of the pendulum, are contained in the system. The pendulum can be set in motion in either a free or forced vibration and is driven by the rubber springs. The motion of the lower end of the pendulum can be recorded on a strip of paper and analysis of the record furnishes information about the properties of the rubber. This unit has worked out well and has made it possible to acquire considerable in-

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# PROPHYLACTIC AUTOMOBILE DRIVING AND CARE

By

DANIEL ROESCH

FOREWORD

Everyone is familiar with the present-day situation wherein the available civilian supply of automobiles is not being augmented by newly manufactured vehicles to replace the daily retirements due to worn-out, wrecked, or obsolescent units. The latter units, for obvious reasons, do not greatly affect the picture. Wrecked machines are now fewer in number, because of lower speed limits and restricted mileage, but there will be an obviously larger percentage (not total) of wrecked units as impairment of mechanical condition increases with age and neglect. The monthly number of worn-out vehicles is (and should be further) very substantially reduced in both percentage and total numbers, because of the greater attention given to careful, conservative, and prophylactic driving, a rigorous program of maintenance needs, and an insistent patriotic and personal-pride urge to extend the useful life of the vehicle. These latter items should be MUSTS.

It is hoped that the following comments will be of some value in enlarging the drive-carefully consciousness and will result in substantially extending the useful life of civilian vehicles. Reasonable expectancy may be doubling of the mileage before therapeutic methods are required over that obtained by the free and easy car handling of a few years ago.

STARTING

Before an internal combustion engine will operate on its normal cycle, it is necessary to crank it by means of an external source of power. The normal automobile engine requires, for functioning, compression of a suitable mixture of gasoline vapor and air and the ignition of the charge. The mixture is self-inducted and necessitates engine cranking before cycle functioning can occur. The conventional starting system includes a storage battery as the source of energy and a series-wound high-torque electric motor to convert this electrical energy into mechanical effort. Other parts of the starting system are cables and a control switch, both of high current-carrying capacity, since the current requirements are seldom less than 150 amperes and may reach 600 to 800 amperes under adverse conditions.

A low voltage drop is essential for the commonly used six-volt battery, (1) to avoid reduced cranking speeds and (2) to retain a sufficiently high voltage during cranking so that the ignition system may function. The placing of the battery under the hood shortens the cables and reduces the voltage drop. Voltage drop increases with the increase of current flowing in accordance with Ohm's law and, therefore, cold-engine starts are more difficult. This adverse condition of low ignition voltage is almost entirely removed when in emergencies, the engine is cranked by pushing the car. The battery drain is now only two to five amperes, and this current will not ordinarily give any appreciable drop in voltage to the ignition. Cars may be pushed or rolled down a hill so that the engine may be cranked by power coming from the rear wheels and transmitted through the rear-axle shafts, propeller shaft, transmission gears, clutch, and then to the engine flywheel. There is more than a fielder's choice in how to do this and some of the choices are errors which can be costly.

Since the rear-axle speed ratio is about four to one, the propeller shaft is rotated four times as fast as the rear wheels. Transmissions have a direct drive in, say, third or high gear. This drive should be used when cranking the engine by car motion. Even in this case the inertia effects of the rotating parts of the engine produce a very heavy torque load on all the driving parts when the clutch is let in. The clutch should be engaged slowly but definitely to avoid clutch or shaft overstress and to avoid tire wear (which may be the beginning of a flat spot). Vehicles are so designed that ordinarily no failure will occur, no matter how crudely this operation is performed. However, many harsh starts of this kind will advance the retirement date significantly.

If the first or second gear transmission drives are used, the stress load on the parts is magnified, with the first gear the worst offender. In the case of cars in reverse drive, the condition is even worse and either first or reverse should be used only in an emergency. In cases of this kind, the clutch engagement should be slow, to reduce inertia effects. Drastic clutch engagement under these conditions can damage a rear axle shaft, a propeller shaft, or its universal joints, in one or a very few applications. The use of the reverse drive in backing down a hill, thereby cranking an engine in the correct direction of rotation gives engine speeds of around twelve times the rear wheel speeds and, if necessary, should be done only with a slow and soft clutch engagement.

The slow clutch engagement is in itself an undesirable operation, either in the above engine-starting procedure or in the normal car-driving operation. Slow clutch engagements mean that the period during which the clutch slips has been prolonged, and any clutch slippage means heat and wear at the clutch surfaces. This heat and wear becomes greater with:

(1) Increased torques being transmitted. In engine cranking by car movement, the third or direct gear drive gives least torque. In car driving and normal clutch operations, reduced throttle gives the least torque.

(2) Increased difference in speeds between the two shafts which are being connected by the clutch (engine and transmission shafts.) Example: If 5 h.p. is being transmitted from an engine at 1000 r.p.m. and

during a brief phase of the clutch engagement the transmission shaft is at 500 r.p.m., then the engine is momentarily delivering 10 h.p. while 5 h.p. is being transmitted. The 5 h.p. loss appears as heat and wear in the clutch. If the condition persists, the clutch would be destroyed by the concentration of heat equivalent to, say, 5 electric flatirons.With an engine speed of 1500 r.p.m. and a transmission shaft speed of 500 r.p.m., the loss is as of 10 flatirons. Add 5 flatirons for each 500 r.p.m. increase of engine speed. It means something to race the engine during clutch engagement. Engine speeds may then be 4000 r.p.m. or more.

Clutch engagement should not be prolonged, and neither should it be so brief as to introduce violent inertia effects. A good rule to follow is to note any sudden jerk to the car itself. A sudden forward motion of the car may be sufficient to place 1000 pounds tangential tractive effort at each rear wheel road contact. On dry concrete some of the rubber may be expected to come off and most of it from one spot. If the wheel spins, a greater amount of rubber comes off from the entire circumference of the tire. With this action the clutch will receive unnecessary punishment. If the car is young, nothing may be apparent at the time. If the car is old, it may need a new clutch. At any rate this procedure is bound to shorten clutch life (and clutches are expensive and difficult to obtain). Careful driving in this respect will change a 25,000-mile normal expectancy of a few years ago to 50,000 miles or more. (Other parts, including tires, will also be conserved.)

Battery cranking of an engine is greatly eased in cold weather by declutching, so that the parts back of the clutch do not have to be rotated. The clutch should be disengaged to conserve the batteries which are now reduced to fifteen-plate size.

The engine start is often facilitated by using the heel of the right foot to open the accelerator throttle pedal while the toe of the right foot is pressing down on the starter pedal. Very often a start is facilitated by alternately opening and closing the accelerator throttle while maintaining the electric starter in operation. This requires a rocking motion of the foot with the toe stationary. The method is beneficial, also, when engines are flooded.

### Mixture During Starting

Cold engines may need a mixture of one pound of gasoline to each pound of air used, whereas the normal operating mixture is one pound of gasoline to approximately fourteen or fifteen pounds of air. This initial enrichment is required since only a fraction of the gasoline evaporates when all the parts are cold. Most engines have automatic chokes which supply this requirement and subsequently lean out the mixture as needed. Under cold conditions a thermostatically controlled latch will hold the carburetor throttle slightly open to give a "fast idle" speed and prevent stalling of the engine. If the engine runs on "fast idle" at this stage, it is advisable to let it operate for a short time without tramping on the accelerator. It is a highly recommended warm-up procedure. For hand-controlled chokes the rule is to progressively adjust as lean as possible as the engine warms up. Cold engines should never be raced or operated under heavy loads. Excess gasoline (unevaporated) lodges on the cylinder walls and washes off lubricating oil. The cylinder walls of cold engines during starting also condense water vapor, formed during combustion, which impairs lubrication and produces other troubles. About one and one-quarter times as much weight of water vapor is formed as the weight of the gasoline burned. Dirigibles have exhaust water-recovery systems to compensate for the weight reduction of the gasoline burned.

### Car Movement

The usual power transmission system of an automobile has three or four different gear ratios in the transmission. The total speed reduction (including rear axle of about four to one) is approximately twelve to one in first gear, or low, eight to one in second gear, and four to one in third or direct gear.

These figures represent, also, the approximate engine torque multiplication which will be applied to the rear wheels from the engine torque. Car designs are made to give final rear-wheel torque abilities (in the first or low gear) which are somewhat under that required to slip the two rear (driving) wheels on dry concrete when the engine is at wide-open throttle.

This slippage condition is a key design-inspection point and amounts to, say, eighty per cent of the weight on the rear wheels. The weight on the rear wheels varies with the acceleration or deceleration of the vehicle and especially on rough roads. Drivers should note carefully the car ahead at its rear-wheel road-contact, and see that its wheels leave the road over cobble stone or similar road conditions. Your car will do much the same a few seconds later. These driving conditions can produce severe tire wear if power is being applied by heavy throttle action, as in pick-up or acceleration or in braking. It is advisable to coast over the bad spots by applying just enough throttle to maintain speed. Too little throttle results in engine braking. Application of power, as in passing cars, under these road conditions causes high tire-wear since the wheels speed up while off the road and are braked severely when they again touch the road.

Some of the weight on the rear wheels is transferred to the front wheels when braking. This may be from 100 to 400 pounds or more. Hence, the customary front/rear brake division of approximately 60/40.

Automobiles may be inspected for tractive effort which occurs in driving or braking. This is equal to the road reaction force. For normal four-wheel brake and two-wheel drive cars, the maximum T. E. approaches the weight of the car. (Some reports show it equal to the weight). This corresponds to a deceleration of, approximately, one "g" or 32.16 feet per second per second. This would be crash braking. Service braking may be from six to twelve or fifteen feet per second per second. These values may be quickly observed by means of bubble, horizontal column, or weighted (Tapley, as example) accelerometers; all are used by students at Illinois Institute of Technology. One of the horizontal column accelerometers has a scale of about two inches for one foot per second per second, and may be used as a drift indicator to show the rolling resistance of a car, which is normally about one-half foot per second per second.

Icy driving conditions limit the possible acceleration because of tire traction to values around one to three feet per second per second. Extreme sleet and wet road condition may reduce the low value given. The maximum possible deceleration or braking effects under similar road conditions are about double (four wheels instead of two wheels) these values and this amounts to virtually no brakes at all.

(Turn to page 52)



JACOBS



KNUEPFER



POTTER



SIEGEL



SMITH

# NEW TRUSTEES

Five prominent industrialists have been elected to the Board of Trustees of Illinois Institute of Technology. Their election was announced following the annual meeting of the board on Oct. 11.

Two of the men are alumni representatives on the board; they are Claude Knuepfer, C.E. '15, president of the General Engineering Works, and David T. Siegel, A. '15, A.S. '25, president of the Ohmite Manufacturing Company. They succeed A. H. Fensholt, M.E. '13, and J. Warren McCaffrey, Ch.E. '22, whose terms on the board have expired.

Mr. Knuepfer, a former president of the Armour Institute of Technology Alumni Association, has been serving as a representative from the College of Engineering on the Illinois Tech Alumni Association Board of Directors. He was instrumental in the establishment of the fund for constructing a field house for the Institute and has contributed much to the fund. Mr. Knuepfer, after graduation, was superintendent and secretary of the Automatic Screw Machine Products Company until he established the General Engineering Works in 1922. He has served as president and general manager of the latter company since that year.

Mr. Siegel established a scholarship at Lewis Institute by making a $1000 contribution to the school several years ago. He is a member of the Illinois Manufacturers Association, the Illinois Chamber of Commerce and the National Association of Manufacturers, and also serves on the Industry Advisory Committee of the War Production Board.

The other three men elected to the board are Whipple Jacobs, president of Belden Manufacturing Company; T. Albert Potter, president of Elgin National Watch Company; and Harold B. Smith, president of the Illinois Tool Works.

Mr. Jacobs began with the Belden Company in 1914 as a cost clerk and rose to general sales manager in 1927. He was appointed vice-president in charge of sales in 1931, and in 1939 at the age of forty-two he was made president of the company. Mr. Jacobs is currently serving as vice-president in charge of civic affairs of the Chicago Association of Commerce; vice-president of the Better Government Association; and president of the Legislative Voters League of Illinois. He is also a member of the Chicago committee for economic development, the U. S. Chamber of Commerce committee on economic policy, and the Illinois Manufacturers Association committee on postwar planning.

Mr. Potter began his career as a salesman for Quaker Oats Company in 1906. He continued in the advertising and manufacturing departments of that company and was mill superintendent in Hamburg, German, from 1909 to 1912. After serving as general manager in Saskatoon, Canada, and in the production and costs department in Chicago, he became vice-president in charge of purchasing in 1929. In 1931, he resigned to become president of the Elgin company.

Mr. Potter is a director of the Public Service Company of Northern Illinois and of the Personal Loan and Savings Bank in Chicago.

Mr. Smith has been president of the Illinois Tool Works for seven years. He began as assistant secretary of the company in 1931, and was made president and treasurer in 1936. He is a director of the Employers Association of Chicago and is serving on the executive committee of the Chicago Branch of the National Metal Trades Association. He is also a member of the board of governors of the Metal Cutting Tool Institute.

PAUL O. RIDINGS.

## THE SCHOOLMASTER

High above the blackboard in the room where a final examination was held was a placard. Its text was REMEMBER THE SYSTEM. A word had been deleted. You know what the word was. HONOR was gone. A blank space remained.

It would be easy to moralize on the mutilation of the sign, to write a dull little sermon about the student who had blanked out the word, and to speculate about the kind of "system" that he and his kind meant to remember and to practice. That would give too much weight to the incident. The student was not a reprobate. Probably he was not a cynic, but one is tempted to think of him as admiring his own attempt at cynicism. He was a smart alec.

The honor system, in so far as the term indicates a formal statement of a code and a regular student organization for enforcing it, is new at the Institute. Before it was established

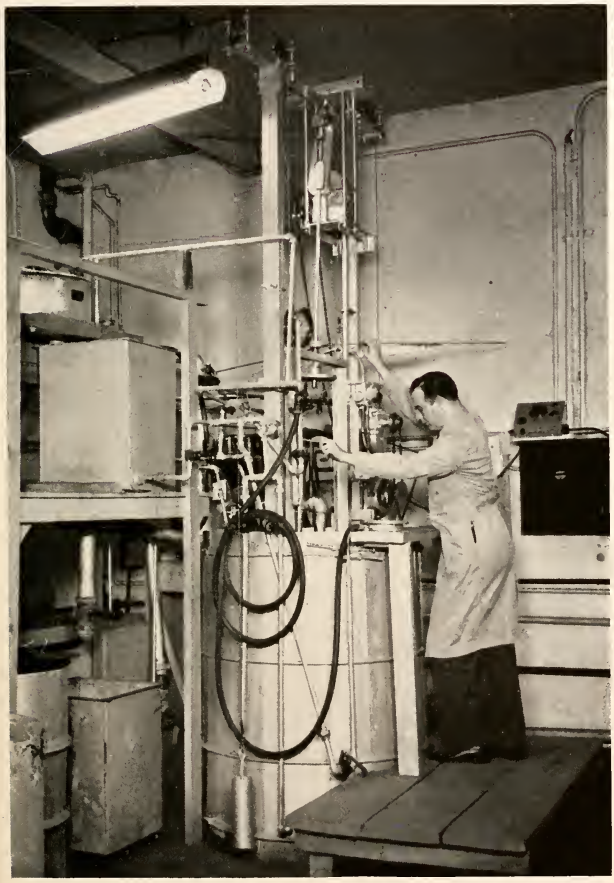
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# BETTER MOUSETRAPS

## AUTOMATIC CONTROL FOR THE PAPER INDUSTRY

By

CLARK E. THORP



View of fiber process pilot plant at the Foundation.

The paper industry of today, although using processes two to three decades old, is largely dependent upon innumerable machine and control developments of modern engineering. Without such developments, the mass production of economical paper products would not be possible.

In spite of this fact, however, there are several procedures used in paper making which are deficient in engineered control equipment. For instance, beating and felting procedures are still considered "arts," requiring men in charge who have specialized in the technique for ten to twenty years. In this period of serious personnel shortage, such men are difficult to obtain.

Essentially, felting consists of suspending individual fibers in a liquid medium and then, by filtration, depositing the fibers upon an interlocking mat or sheet. The ratio of fiber to liquid is very low and must be controlled very closely. If an amount of paper equal to the weight of a penny were broken up into individual fibers and suspended uniformly in 90 gallons of water, the ratio of fiber to water would be approximately that used in many felting procedures by the paper industry. This is approximately one-half the turbidity of ordinary Chicago tap water.

Consistency is the term used by the paper industry to express the percentage of pulp contained in a pulp-liquid mixture. It is usually given as grams of dry pulp contained in 100 grams of total pulp-liquid mixture. The quantitative deposition of pulp from a pulp-liquid mixture upon a filtering medium such as a screen depends upon many factors, but one of the most important is the consistency of pulp-liquid mixture. The accuracy with which pulp can be quantitatively deposited, all other factors being constant, depends upon the accuracy with which consistency can be controlled.

Because of the absence heretofore of an automatic controlling device, an empirical manual control has been used by the paper industry to regulate consistency. If deposition is too high, the consistency is simply decreased, and conversely, if deposition is too low, the consistency is increased. This manual control is entirely inadequate because no operator can accurately judge consistency, and as a result, the consistency in the felting procedure is continually being adjusted back and forth between wide limits. This causes a substantial variation in weight of the deposited pulp form.

At Armour Research Foundation an automatic control has now been developed which will aid materially in

eliminating the need for specialized human control of felting procedures.

The new control will accurately regulate consistencies in the range from 0.001 per cent to 0.25 per cent. The device is entirely automatic in operation and not only detects variations from proper consistency but automatically adds the correct amount of pulp to maintain the consistency at the predetermined level. A pilot plant has been placed in operation using the automatic consistency control, and innumerable runs have been made on common types of pulp at various consistencies.

The automatic consistency control is based upon the principle of light absorption by suspended pulp particles. Variations in pulp concentrations will naturally cause variation in light absorption and thus operate the control.

In the pulp-liquid suspension, light will be absorbed not only by pulp but also by the liquid. A consistency control based upon only one absorption cell will therefore give the additive result of both pulp and liquid absorption factors. Hence if the light absorbing components of the liquid do not remain constant, they will cause corresponding inconstancy in a consistency control unless compensation for "white water" is made.

In most paper mill practice, the liquid used to form a pulp suspension is water which, if reused, contains a variable amount of turbidity and color. Provision must be made to measure the amount of light absorbed by this "white water" and subtract its values from the total absorption value obtained for the pulp-white water suspension. The net result will then be an absorption value for the pulp alone. This measurement and subtraction of "white water" absorption values is done continuously and automatically by the automatic consistency control which has been developed.

The automatic consistency control has been in service for some time in the Armour Research Foundation pilot plant and a considerable amount of operating data has been obtained. From six runs, involving over 200 consistency tests, enough data were obtained to prove that the control is constantly more reliable than present "rule of thumb" factory procedure. Actual tests made in a paper processing company's factory show that consistency errors of plus or minus ten per cent are encountered when using the old methods. In contrast, the maximum error allowed by the automatic consistency control unit is plus or minus three per cent at high consistencies, and at low consistencies the

(Turn to page 54)

# MIDWEST POWER CONFERENCE—1944

The 1944 Midwest Power Conference will be held April 13 and 14 at the Palmer House, Chicago. The basic theme of the program will be "Power Brings Victory." Papers presented at the meeting will relate to power problems in wartime, and to planning for our postwar power needs.

In 1943, many meetings and conferences were postponed. The Midwest Power Conference was held as usual, and its attendance was about 2500, approximately seventy percent more than in 1942. The project was definitely not a war casualty, but a war aid.

The conference began, under private sponsorship, in 1926. In 1938 it was reorganized, and the coming session will be the seventh meeting under the sponsorship of the Institute, in cooperation with other colleges of engineering and with engineering societies. Schools which have already indicated that they will participate in 1944 include Iowa State College, Michigan State College, Northwestern University, Purdue University, and the Universities of Iowa, Illinois, Michigan and Minnesota. The collaborating engineering groups include the Chicago sections of the Founder societies, and others.

Although the program is still in process of arrangement, sixteen topics for papers and discussions have already been selected. They are: Postwar Conditions and Planning of Our Water Supply, The National Fuel Situation, Flux Mapping and Field Plotting, Experiences with Single-Pole Reclosing, Sleet-Melting Practice, Corrosion Problems, Statistical Comparison of Fuels, The Near-Future Aspect of Oil Versus Coal, Application of Electronics to Power Generation, Welds in High-Pressure Headers, Inhibitors in Condenser-Tube Alloys, Maintenance Systems, Superchargers as Applied to Internal Combustion Motors, Isolation of Vibration from Diesel Plants, Evaporation Coolers, and Boiler-Water Treatment.

A more detailed program will appear in the March issue of the *Engineer and Alumnus*. Present plans provide for eight sessions: the opening general meeting, and sessions assigned to central station practice, electrical power problems (two sessions), plant maintenance, fuels and combustion, industrial power plants, and diesel power.

One luncheon and one session will be under the sponsorship of the Chicago Section of the American Society of Mechanical Engineers; another luncheon and another session of the Conference will be sponsored by the Chicago Section of the American Institute of Electrical Engineers.

The outstanding social event of the program, the All-Engineers Dinner, is scheduled for the evening of Thursday, the first day of the Conference.

Inquiries about the Conference may be addressed to Professor Stanton E. Winston, director, or to Professor Charles A. Nash, conference secretary, at the Illinois Institute of Technology, 3300 South Federal Street, Chicago 16, Illinois.

## THE SUN SALUTES HEALD

The following article is quoted from The Chicago *Sun* of October 20, 1943:

*So that the outstanding achievements and good deeds of the men and women of the Chicago area may not go unrecognized, each day The Chicago Sun will pay public honor to an individual for his or her good works.*

Today The Chicago *Sun* salutes Henry T. Heald, president of Illinois Institute of Technology, which held its third commencement of the year Sunday.

The reason this is possible is that long ago Heald placed his college on a round-the-calendar wartime basis to accelerate the training of engineers, so desperately needed in the war effort.

This progressive step is but one of many important contributions Heald has made to the war effort. He was one of twelve college presidents who

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The Institute of Gas Technology is the youngest of the three independent but affiliated institutions which constitute the Illinois Tech family. Its functions and activities are accordingly less well known than those of its older associates, Illinois Institute of Technology and the Armour Research Foundation. This brief report will constitute the first of a series which will present a continuing picture of the new and expanding Gas Institute.

The story of the founding of the Institute of Gas Technology was related in the October, 1941, issue of this journal by Mr. Harold Vagtborg, who, during the Gas Institute's first two years, directed its operations as well as those of the Armour Research Foundation. Mr. Vagtborg, on September 1, 1943, turned over to the incoming director an organization which was in full operation, with a research staff of twenty-five men and women, a library of 3000 volumes, and a graduate student body of twenty-one Fellows. The directors of the Gas Institute have expressed to Mr. Vagtborg their deep appreciation of his remarkably successful organizational activities, which despite the apparently insuperable handicaps of the war, brought the Institute from a vision to a reality in less than two years.

The Gas Institute was established by the Research Organization Group, a committee of outstanding gas utility and appliance executives who were led by Mr. Frank C. Smith, President of the Houston Natural Gas Company. This group surveyed some ninety institutions throughout the entire country and then selected Illinois Institute of Technology as the one educational center which was most nearly adapted to the needs of the gas industry. Established as an Illinois corporation, and officially named the Institute of Gas Technology, the new institution was dedicated to the purpose of instructing students on the graduate level and "for research in literary and scientific branches of learning, including the production, distribution and utilization of natural and manufactured gas and its by-products and the production of appliances utilizing these products."

The affiliation agreement between the two institutions provides that the Board of Trustees of Illinois Institute of Technology shall grant appropriate degrees to the students of the Gas Institute who have completed the course of study required for such degrees by the Committee on Faculty and Degrees of the Board of Trustees of the Gas Institute. For the degree of Doctor of Philosophy, the agreement further provides that students shall have successfully completed a course

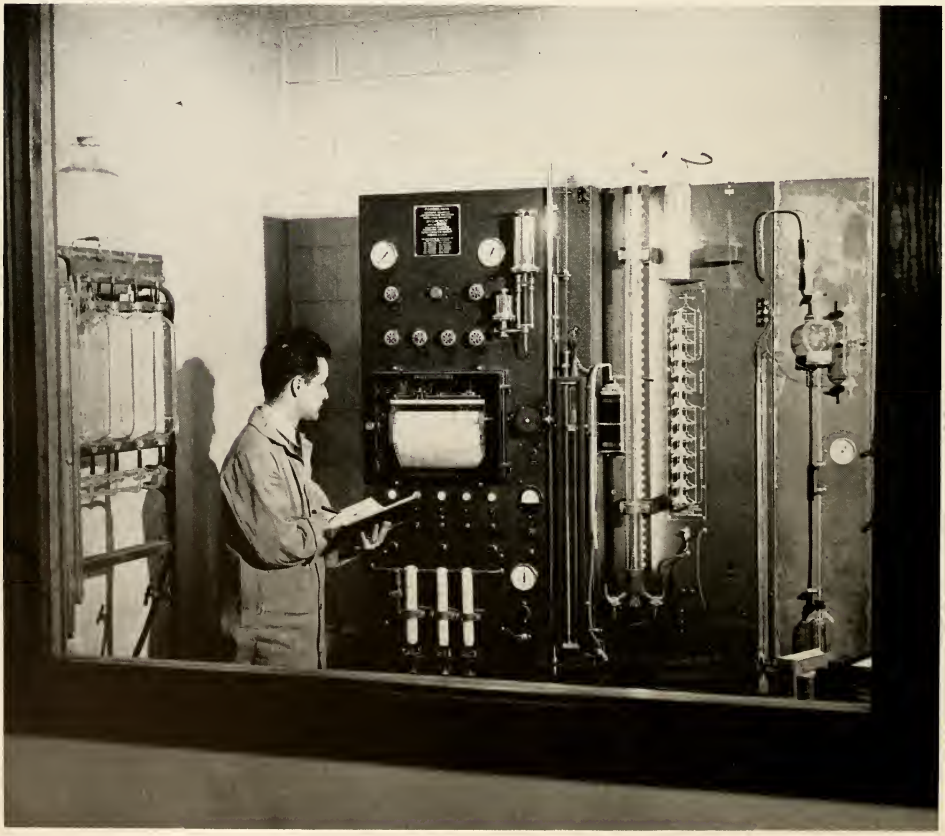
of four academic years in length, plus three summers of employment in the gas industry. Although three years of graduate study are normally required for the Ph. D., the Gas Institute's program includes a fourth year which is designed to give the background of the gas industry.

This cooperative feature of the educational program is one of its most valuable aspects. By acquainting the Fellows with the facts of life in their future industry, it will aid both the Fellows and the industry. The value of the co-operative system of undergraduate education has been amply demonstrated by the outstanding work being done in war industry by Illinois Tech's co-op alumni. By relating what they learn in school to the problems of the gas industry, and particularly by carrying out important basic research as a part of their course, the Fellows will contribute to the advancement of the industry both before and after their graduation.

Each of the Gas Institute's twenty Fellows is acting as a graduate assistant in some phase of Illinois Tech's war effort. Six men are working for the Armour Research Foundation on a confidential project for which their training and their summer industrial experience have made them particularly well-qualified. Three men are graduate assistants in the metallurgical laboratory, one in chemistry, four in technical drawing, and six in physics. Thus the Fellows are complying with the War Manpower Commission's requirements by combining advanced study in scientific fields with not less than twelve hours of war-essential work each week.

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Dr. Charles Riesz I.I.T., B.S., M.S., Ph.D., conducts a gas analysis with the Podbielniak hydrobot at the Institute of Gas Technology.



# NEW FACULTY MEMBERS

FURIO ALBERTI, Instructor in Mathematics, received his B.S. degree from the University of Chicago. After several years teaching in suburban high schools and junior colleges he was awarded a scholarship at the University of Chicago and began to specialize in the field of algebra. He is now writing his thesis on *Classification of Associative Algebras of Low Orders into Non-Isotopic Classes* under the guidance of Professor A. A. Albert.

RUTH MASON BALLARD (Mrs. Foster K. Ballard), Instructor in Mathematics, received the degree of B.A. at Wellesley College, and the M.S. and Ph.D. degrees at the University of Chicago, where she held a fellowship. She also was awarded the Horton Hallowell Fellowship, and has done post-doctoral work at the University of California. She has taught at Wellesley, the University of Illinois, and Wright Junior College of the Chicago public school system. Dr. Ballard is a member of Sigma Xi, Pi Mu Epsilon, and Sigma Delta Epsilon, and of the American Association for the Advancement of Science, the American Mathematical Society, and the Mathematical Association of America. She traveled in Europe in 1936 and 1938.

PHILIP LINCOLN BROWN, Instructor in Mathematics, has his B.A. degree from Denison University, and his M.A. degree in mathematics from Michigan State College. He has done graduate work at Ohio State University, and has been a graduate assistant at Michigan State and Ohio State.

LOUIS DOLINKO, Instructor in Physics, received his B.S. degree from Brooklyn College and has done graduate work in physics at Columbia and New York Universities. He was stationed at Scott Field, Illinois, as an

ALBERTI



BALLARD



DOLINKO



HELLY



HOMMES



HUNTER



KEPNER



KINCAID



*Root Studios*

instructor in radio engineering for the Air Forces and helped to organize the curriculum for Chicago Radio School No. 5 when the army occupied the Stevens Hotel. He was coordinator of the instructors' training branch at the latter institution and the only civilian columnist for the Chicago school's newspaper, *Skylines*. He also conducted a review course in basic radio theory for instructors in the Signal Corps pre-radar training program at the Lewis campus.

HERMAN O. GERHARDT, Instructor in Technical Drawing, graduated from Armour Institute of Technology in 1934, with the degree of B.S. in Architecture. He has attended Chicago Teachers College, and is working for the degree of M.S. in Industrial Education at that institution. Before entering Armour he taught architectural and mechanical drawing for two and a half years at Fenger High School. He is a licensed architect, has worked in several architectural offices in Chicago, and is now a member of the architectural firm of Koerner and Gerhardt.

EDWARD HELLY, visiting lecturer in Mathematics, received his Ph.D. at the University of Vienna shortly before the first World War. Entering the Army, he was wounded and taken prisoner by the Russians, and during four years of captivity he was in various parts of Russia, and almost as far east as Vladivostok. During this time Dr. Helly wrote his well-known paper on equations with infinitely many variables. From 1921 to 1938 he was professor at the University of Vienna and actuary with a large insurance company. As a consequence he made important contributions to pure mathematics (topology and real variables) and to applied mathematics (statistics). In 1938, Dr. Helly and his family came to the United States. Together with Mrs. Helly, who is also a Ph.D. in Mathematics of the University of Vienna, he taught at the College of Paterson (New Jersey) and at Monmouth Junior College (New Jersey). Early in 1943 they came to Chicago and taught in the Signal Corps courses on the Lewis campus.

(The ENGINEER regrets to report the sudden death of Dr. Edward Helly, after the foregoing paragraph was on the press.)

JOHN HOMMES, Assistant Professor of Fire Insurance, graduated from Armour Institute of Technology in 1929 with the degree of B.S. in Fire Protection Engineering. He was with the Kentucky Actuarial Bureau at Louisville for many years as inspector and engineer. Since 1941 he has been associated with the Western Actuarial Bureau in Chicago, specializing in fire insurance rating schedules. He is a member of Tau Beta Pi and Salamander fraternities.

THOMAS A. HUNTER, Instructor in Physics, graduated from Illinois Institute of Technology in 1940 as an honor student in the Department of Fire Protection Engineering. For two and a half years he was employed by the Western Factory Insurance Association as an inspector in Chicago, Cincinnati, Kansas City and the Great Plains States. He returned to the Institute in 1942 to work for the M.S. degree in Mechanics, and is now doing research work on the fatigue of rubber. He is a member of Tau Beta Pi, Salamander, Sphinx, and Black Knight fraternities.

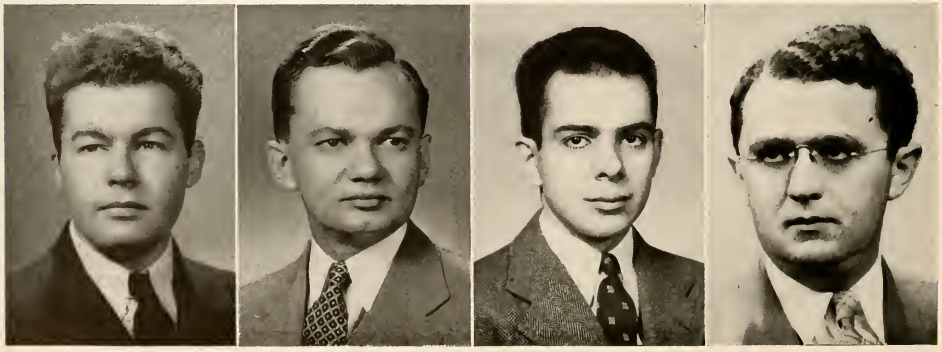
CHARLES KEPNER, Registrar of Illinois Institute of Technology, holds the degree of A.B. from Grove City College, and the Ph.D. degree from the University of Pittsburgh. He has done additional graduate work at Princeton and Temple Universities, and at the University of Pennsylvania. Mr. Kepner has made a survey of educational systems, visiting Russia, and various European and oriental countries. He is a member of Pi Gamma Mu and Phi Delta Kappa fraternities, and of the Society for the Promotion of Engineering Education.

NORMAN KHARASCH, Instructor in Chemistry, has returned from leave of absence, during which he has completed the work required for his Ph.D. degree at Northwestern University. He is the author, in collaboration with Professor H. Mackenzie, of a recent book, *Essentials of College Chemistry*, which has been reviewed favorably and is in use at Purdue, Illinois Tech, University of California at Los Angeles, Simmons College, University of Alberta, and Mount Royal College, Calgary. Mr. Kharasch is a member of Sigma Xi and Phi Lambda Upsilon honorary fraternities.

WILL K. KINCAID, Instructor in Physics, received his B.S. and M.S. degrees at Indiana State Teachers College. For several years he was principal of a high school in Indiana; during the past year he has taught mathematics at Illinois Institute of Technology. Mr. Kincaid is a member of Kappa Delta Pi honorary fraternity.

GEORGE W. LARSON, Instructor in Technical Drawing, graduated from Illinois Institute of Technology

LARSON MISER ODISHAW REINGOLD



*Root Studios*



RENNE



SEVERUD



VOLBERDING



WAGENKNECHT



WAGNER

in 1942, receiving a B.S. degree in Architecture, and was awarded the A.I.A. medal for scholarship. He returned later the same year to Illinois Tech as a graduate student in architecture and as a part-time instructor and was made a full-time instructor in 1943. He was a co-winner with George Storz of second prize in the Kawneer Metal Co. Nation-Wide Store-Front Design Competition, the design being published in the February issue of *Pencil Points*. He is a registered architect in the State of Illinois and a member of the Ring and Scarab fraternities.

HUGH J. MISER, Instructor in Mathematics, is a graduate of Vanderbilt University and holds his M.S. degree from Illinois Institute of Technology. He has done graduate work at Ohio State University, and has been a graduate assistant there and at Illinois Tech.

HUBERT ODISHAW, Instructor in English, received his B.A. and M.A. degrees from Northwestern University. He has done graduate work at Princeton, and has begun work on his doctoral thesis. Coming to the Institute in the summer of 1940 as a part-time instructor in English, he enrolled as an undergraduate student in electrical engineering, and will receive his bachelor's degree next February. He is a member of Phi Beta Kappa.

HAROLD H. POKRAS, Instructor in Physics, has his B.A. and M.A. degrees in Chemistry from the University of California at Los Angeles. He is now working at the Institute on the synthesis and properties of some organic phosphorous compounds, the subject of his doctoral dissertation.

HAIM REINGOLD, Assistant Professor of Mathematics, received B.A., M.A., and Ph.D. degrees at the University of Cincinnati. He also studied at New York University and the University of Michigan. He has taught at the University of Cincinnati (1936-1938) and has been head of the Department of Mathematics at Our Lady of Cincinnati College (1938-1942). From June, 1942, to July, 1943, he organized and supervised the mathematics instruction of the Signal Corps Training Schools at the Illinois Institute of Technology and also of the E.S.M.W.T. evening program. Dr. Reingold is a member of Sigma Xi, the American Mathematical Society, and the Mathematical Association of America.

HAROLD S. RENNE, Instructor in Physics, graduated from Kalamazoo College, *cum laude*, and took his M.S. degree in Physics at Syracuse University. For several years he was an electrical engineer at Underwriter's Laboratories, Inc., working mainly on electronic equipment. He has taught radio courses in the Signal Corps training programs on the Lewis campus, and for several months was laboratory supervisor of the pre-radar program. He is an associate member of Sigma Xi, a member of Sigma Pi Sigma, and an associate member of the Institute of Radio Engineers.

RUTH SEVERUD, Instructor in Applied Arts, has the degree of B.S. from Winona State Teachers College. She has done graduate work at the University of Colorado; at Harvard, on a Carnegie art scholarship awarded by the American Institute of Architects; and at the University of Oregon, on a similar scholarship. She has been a member of the applied arts faculty at Iowa State College. Miss Severud has exhibited in New York City. She is a member of the Committee on Art in American Education and Society, and a member of the Western Arts Association.

FRED F. VOLDERDING, Special Instructor in Fire Protection Engineering, graduated from Armour Institute of Technology with the degree of B.S. in Fire Protection Engineering. For two years he was an engineer for the Iowa Insurance Service Bureau; for the past seventeen years he has been an engineer in the rating and engineering department of the Cook County Inspection Bureau.

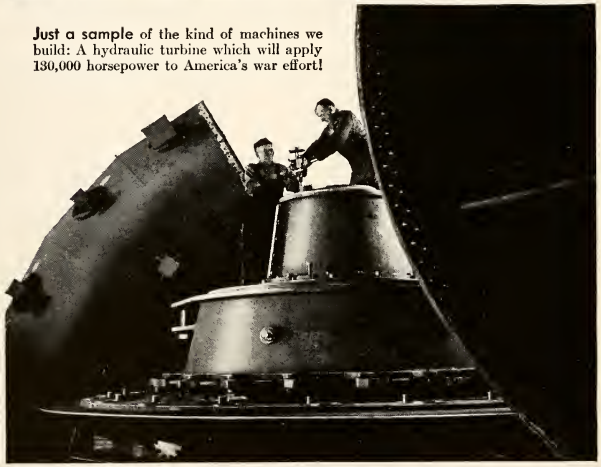
EDWARD WAGENKNECHT, Associate Professor of English, holds the degrees of Th.B. from Union Theological College; Ph.B. and M.A. from the University of Chicago; and Ph.D. from the University of Washington. An ordained minister, he has served several congregations. He has taught English at Central Y.M.C.A. College, the University of Chicago, the University of Washington, and the University of Southern California. For several years he was editor of the book

(Turn to page 56)

# Shrink the World



**Just a sample** of the kind of machines we build: A hydraulic turbine which will apply 130,000 horsepower to America's war effort!



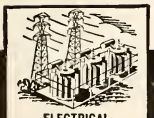
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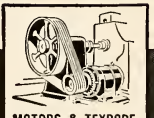
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ELECTRICAL EQUIPMENT



STEAM AND HYDRAULIC TURBINES



MOTORS & TEXROPE V-BELT DRIVES



BLOWERS AND COMPRESSORS



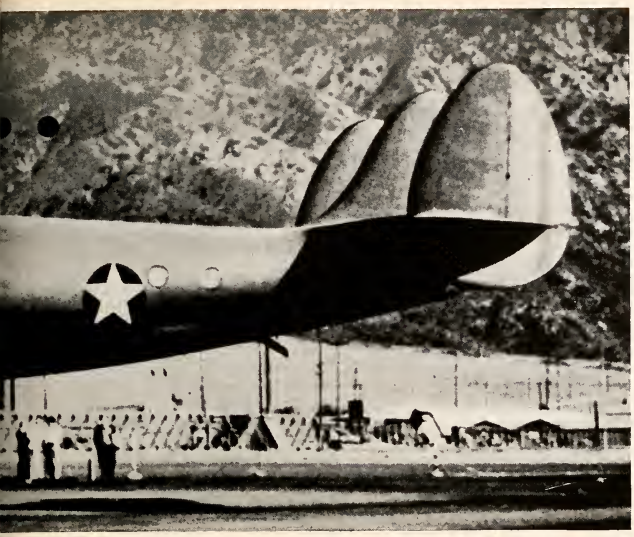
ENGINES AND CONDENSERS



CENTRIFUGA PUMPS

ALLIS-CH

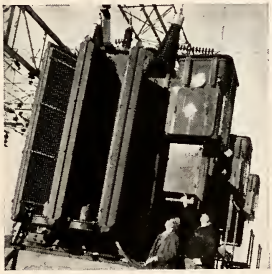
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# the Nation!

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One of many Allis-Chalmers transformers that help transmit vital electrical power to U. S. war plants.

## VICTORY NEWS

**A-C Maintenance Booklets Now In Spanish, Portuguese!** More than 200,000 Allis-Chalmers booklets on wartime maintenance of motors, pumps and rubber V-belts have been requested by men in industry whose job it is to keep machines running.

So great a demand has also come from South American countries that these booklets are now being printed in Spanish and Portuguese.

They are packed with practical information which is particularly helpful in training new men for the important job of making motors, pumps and rubber V-belts last longer during this critical war period. Write for your copies (English, Spanish or Portuguese) today.



**Good Neighbors** get together! The picture above shows Allis-Chalmers equipment ready for an important road-building job near Rio de Janeiro.

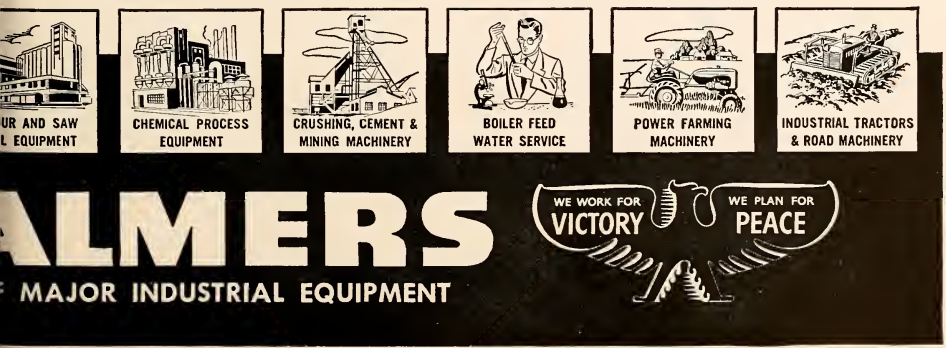
**A-C Aids Ship-Building Program:** America's shipyards have already smashed every ship-building record in the book—and production of merchantmen and warships is still climbing.

A-C is one of the companies which is feeding these yards. It supplies a larger variety of equipment for ships than any other company in the U.S.A.

Belts, blowers, castings, condensers, control devices, generators, motors, turbines, rudders, complete hull sections, transformers, pumps are just a *few* of the items which we are supplying.



**FOR VICTORY**
**Buy United States War Bonds**



# HELP! HELP! HELP!

There are in the United States 133 accredited engineering colleges. The list of accredited colleges has been slowly built up. Thousands of engineering graduates have been prepared for engineering efforts. Some thousands of engineers who have graduated from accredited colleges have followed careers other than engineering.

*The Journal of Engineering Education* for June, 1943, has an article titled "The Personnel Situation in Engineering," with sub-titles "War Manpower Commission, Bureau of Placement," "National Roster of Scientific and Specialized Personnel," "Bulletin No. 3, April 13, 1943." It reports that on March 1, 1943, there were 280,000 professional engineers in the United States, this number including those who had completed a four-year course in a recognized engineering college or who had the equivalent of such a course. Graduates who have left the profession are not classed as engineers, but the number does include men who are in administrative positions because of their technical knowledge.

Bulletin No. 3 classifies these 280,000 engineers and estimates the need for additional engineers as shown in the following table:

These engineers are classified as follows:

| Type of Engineer | Employed As of January 1, 1943 | Needed by June 1, 1943 |
|---|---|---|
| Mechanical Engineers | 85,000 | 9,000 |
| Aeronautical Engineers | 9,000 | 6,000 |
| Civil Engineers | 87,000 | —7,000 (more than needed) |
| Electrical Engineers | 59,000 | 10,000 |
| Chemical Engineers | 16,700 | 2,000 |
| Mining Engineers | 11,700 | 500 |
| Metallurgical Engineers | 10,600 | 2,000 |
| Industrial Engineers | | 3,000 |
| | | 25,500 needed |

(By the end of 1943, 40,000 to 50,000 engineers will be needed.)

These 280,000 engineers are employed as follows:

| Type of Employment | Number of Engineers |
|---|---|
| Manufacturing | 105,000 |
| Mining | 12,000 |
| Construction | 20,000 |
| Private consultants and their staffs | 10,000 |
| Transportation, communication and public utilities | 40,000 |
| Teaching (Engineering subjects) | 5,000 |
| Navy Department | 13,000 |
| Other Federal Government agencies | 14,000 |
| State, county and municipal government | 21,000 |
| TOTAL | 280,000 |

Approximately 19 percent of these engineers are in the armed forces and in the War and Navy Departments; 12 percent are in other governmental positions; 49 percent are in manufacturing, mining and construction. The remaining twenty percent are employed in transportation, communications, public utilities, private consulting offices and colleges and universities. (Only 5,000 teachers are used to teach the engineering subjects in all engineering colleges in the United States.)

Figures compiled by the National Roster estimate 47.1 percent of these 280,000 engineers are under thirty-eight years of age.

The enrollment of the United States engineering colleges went up from 1940 to the autumn of 1942. But now in the autumn of 1943 the enrollment of engineers in accredited colleges in this country approximates 41 percent of the enrollment of last autumn.

The increased enrollment in engineering colleges was due to a variety of causes:

(1) The great demand for engineers had increased the salaries paid to engineers. Salaries have steadily gone up since 1938. Now the starting salary for a basic 40-hour week is about 75 percent greater than in 1938.

(2) The value of technical and scientific training had increased because of the needs of the armed forces. (This training provided better chance for commissions.)

The civilian enrollment of engineers has decreased this autumn for the following reasons:

(1) There has been great social pressure on young men not in uniform who are attending colleges.

(2) Many undergraduates in the colleges last autumn were committed to the armed services.

(3) The chief reason now for the decreased enrollment is the issuance of selective service directives from Washington. These directives insist on a certification that a registrant in an engineering college is pursuing a course of study for a critical occupation, that he is a full-time day student in good standing and that he is competent and able to finish his course in 24 months.

Most freshmen (about 95 percent at Illinois Institute of Technology) are about eighteen years of age when entering college. So these lads receive their 1A's before they can accumulate enough credits to be certified. A small number of graduates of accredited high schools, who are seventeen years of age, desire to enter accredited engineering colleges. Only one out of every five students is eligible because in order to be eligible the student must have successfully completed the necessary high school mathematics, physics and chemistry courses. Most of these eligible students find it necessary to make up some high school courses while in an accredited engineering college.

There are now approximately 40,000 civilian engineers left in accredited engineering colleges. By June, 1944, about 13,000 will have graduated. (Most of these, judging by our past experience, will enter the armed services.) Many undergraduates are "flunking out" of college every term. Many other engineering students quit to join the armed services because they either cannot stand the social pressure or because they just must join up because of fever heat to fight. Others, juniors and seniors, are joining the army and navy cadets at engineering schools.

So now with industry over 30 percent behind in production and shipping every week, with the peak production hoped for in the spring of 1944 far below what is needed, with the dwindling supply of engineers for industry and with the future supply of engineers virtually cut off at the source, with local draft boards and appeal boards reluctant (because of social pressure) to let engineering students finish their courses in spite of favorable directives from the War Manpower Commission, with the same reluctance on the part of local and appeal boards to allow single men of military age who are engineers to work in defense plants, it is up to industry that needs engineering talent to fight for every engineer.

Industry now is 50,000 engineers short of what is urgently needed. The shortage is most acute in the fields of electrical, radio, mechanical, aeronau-

(Turn to page 58)




# CIRCUITS OF VICTORY!

THIS Signal Corps lineman and his comrades are building and keeping open the telephone lines that help to coordinate attack and defense in every battle zone. Not only on land, but also at sea and in the air, telephone and radio equipment made by Western Electric is helping to bring Victory closer.

This Company—for 61 years the manufacturer for the Bell Telephone System—is today a vast arsenal of military communications equipment. This field of Engineering for manufacture offers a wide range of opportunity to men who are interested in the technical problems of production.

* * *

*Buy War Bonds regularly—from now till Victory!*

**Western Electric**

IN PEACE...SOURCE OF SUPPLY FOR THE BELL SYSTEM.
IN WAR...ARSENAL OF COMMUNICATIONS EQUIPMENT.

ARMY E NAVY

# FROM YEAR TO YEAR

## A RECORD OF OUR ALUMNI AROUND THE WORLD

### MEN OF THE MONTH

JUHNKE



Palm Sunday, 1892, there landed at the Eastern seaport of Baltimore a family of German immigrants, consisting of father, mother, and five upstanding youngsters. One remarkable thing about these young people was that all of them, at one time or another, were to be enrolled at Illinois Institute's West Side campus, then still merely a project in the hands of the trustees of the estate of Allen C. Lewis. The eldest of these children and the first to enter the infant Lewis Institute was Paul B. Juhnke, a graduate of its third engineering class in 1903, and now the chief operating engineer of one of the world's greatest power systems. In his achievement he finds confirmation of the continuing role of America as the land of opportunity.

His family came from the northeastern part of Germany where Copernicus first delineated the nature of the solar system and where Immanuel Kant first issued his *Critique of Pure Reason*. Here the remotest spurs of the Carpathian Mountains intermingle with the Baltic plains, producing an undulating landscape in which pine-clad hills rim long, narrow, mountain-type lakes. Lazy streams bisect meadows merging into farmlands, not too fertile, supporting people who, though frugal, possess a love of life as vivid as will be found in any great metropolis. Of this love of life Paul Juhnke has retained a good share, which enables him to carry the burden of life and position with comparative ease.

The earliest days of an immigrant family of that time were not usually characterized by abundance, and Paul started to work at the age of twelve. Lack of money for the more commonplace diversions directed him quite naturally to evening schools and library reading rooms, free from the painful exactions of coin of the republic. An excellent primary education brought to him an aspiration for higher education, and what money could be made available was devoted to private tutoring. The late Professor Jenson, a graduate of Göttingen,

ROESCH



for years a tutor in the family of the Duke of Norfolk, and later a principal of a public school in New York City, then directed a classical college on Chicago's northwest side, where the young immigrant boy received a keen appreciation of the best in English literature. Wyman C. Ludlow, one of the first two graduates in mechanical engineering in the Lewis Class of 1901, taught him algebra and geometry in 1898 and 1899 in the evening courses of the newly opened Lewis Institute, thus enabling him to take up college work in the day school, from which he was graduated in 1903.

Soon after this, he obtained a posi-

tion with the Commonwealth Edison Company at a rate of pay almost exactly half of what he had earned before he entered Lewis four years before. The position was not a pretentious one: it involved overalls, a sledge-hammer and chisel, and bore the designation of "helper to a construction mechanic." This, however, was only the professional *Stürm und Drang"* and in a little over six months he was promoted to foreman of construction mechanics. A few months later he was assigned to a very hazardous position, much more remunerative than any pre-college employment, and in another six months he was transferred to the important load dispatcher's office, organized to direct the operation of the young Edison System. At that time the system had a maximum load of 40,000 kilowatts, or less than one twenty-fifth of its present-day rating. Seven years later he was made chief of this office, and held that position during the epochal period of growth of electric power in Chicago.

During this period he contributed numerous articles to the technical press, and organized and served as president of the Interurban Public Service Company, which supplied a number of communities in an area between Chicago and Elgin until its absorption by the Public Service Company of Northern Illinois.

At the beginning of the great depression he published a paper on economics, which expounded the theory that the free enterprise system, for successful functioning, requires the preservation of established capital values, and that the destruction of these from any cause whatsoever inevitably leads to unemployment and general calamity. The further exposition of this thesis for wider understanding by the great masses, he reserves as a goal and hobby for post-retirement days.

Ever since graduation Mr. Juhnke has exhibited a keen interest in the affairs of his Alma Mater; this interest has not diminished with its inclusion in the Illinois Institute of Technology. In 1924 and 1925 he was president of the Lewis Alumni Association, and in 1942, vice-chairman of the Living Endowment Drive. In his undergraduate days at Lewis Institute, Mr. Juhnke was interested in various extra-curricular activities, being president of the Parnassian Society and a member of the Daedalian fraternity.

In 1942 Mr. Juhnke was made assistant chief operating engineer of the Commonwealth Edison Company, and in January, 1943, chief operating engineer. His activities now are mostly of an executive nature, and he deals more with men than with apparatus and tools. To his problems he brings the concept that the interest of manpower and personnel transcends that of apparatus and plant, one which is vastly in advance of that prevailing in industrial relations when he first landed on these shores. This concept is completely in harmony with his philosophy of life. He subscribes to the doctrine that rendering aid to one's fellow men, even to the submergence of oneself, leads to the greatest satisfaction in life.

His wife was Louise Venn, daughter of a most respected physician who served Chicago's northwest side for almost forty years. Of their four children, Paul, Jr., Adele, Mary Louise and Charles, Adele is an ensign in the Coast Guard and Charles is a 1st lieutenant in the Ordnance Section in the Mediterraneau theater of war. This service to the nation a proud father appraises as the family's recognition of an obligation to the country of his adoption.

Mr. Juhnke has many diversions. Foremost of these is his improvement of his fine summer place on what once was an island but has now been changed by him into a peninsula, on the north shore of Lake Marie near Antioch. He likes golf, bridge and dancing. He is a member of the Union League Club and a director of the Alexian Brothers' Hospital Foundation. He has been a member and chairman of a number of technical committees, local and national in scope; a director of the American Institute of Electrical Engineers from 1933 to 1936; and chairman of its Chicago Section and of the electrical section of the Western Society of Engineers in 1928.

Mr. Juhnke is a person of high ideals and is, withal, a good mixer. He is liked and admired by his colleagues, business associates and friends. He is indeed an outstanding graduate of the Illinois Institute of Technology.

HOWARD A. CARTER

## DANIEL ROESCH

Working quietly and unobtrusively in the laboratories he designed in 1917, Professor Daniel Roesch, who has helped shape more Armour careers than is generally known, richly deserves nomination for the man of the month in this *Engineer* series.

Daniel Roesch, professor of automotive engineering, first became interested in Armour Institute of Technology in the nineties. On his weekly excursions to the South Side campus to watch his brother, Charles, play football, he was attracted to the engineering courses that were given there. His contact has been almost continuous since then, except during several years following his graduation when he did professional work in utility plants in Ohio. Successively he has been instructor, assistant professor, associate professor and professor in the Mechanical Engineering Department of the Institute. The dates, respectively, of these appointments were: 1911, 1914, 1916 and 1929.

A native of Aurora, Illinois, Professor Roesch received his primary and high school education there. He was born May 7, 1882, and spent his childhood in the attractive Fox River town just thirty-five miles from Chicago. He entered Armour Institute of Technology in 1900 and was graduated in 1904 with the degree of Bachelor of Science in the Department of Mechanical Engineering. He was awarded the professional degree of Mechanical Engineer in 1908.

After graduation from Armour, Professor Roesch joined the engineering staff of the Westinghouse Machine Company as an experimental engineer, and in 1906 he supervised the installation of the first gas producer at Ashley Falls, Mass. He resigned this position in 1907 and became chief engineer for the Citizens' Gas and Electric Co. at Lorain, Ohio. He remained at Lorain until 1911, when upon visiting the great teacher and engineer, Professor George Gebhardt, head of the Mechanical Engineering Department at Armour, he was offered a teaching position on the Institute's mechanical engineering staff. When the automotive laboratory was erected in 1917, Professor Roesch selected and installed the equipment that for many years was considered among the best of its kind in educational institutions.

Probably the greatest contribution to engineering education that has been made by Professor Roesch is the development of a series of laboratory instructions and manuals that are designed to anticipate future problems in the internal combustion engine field. The first of these is entitled *Engine Classification,* and has been in use in the automotive laboratory for many years. More recently completed is a manual of 169 pages covering Diesel engines. Professor Roesch has developed an automotive engine testing manual that includes altitude power curves. This latter work is a very up-to-date treatment of testing

problems and permits determination of power at different altitudes and manifold pressure at various speeds.

In commenting upon his work as a teacher, Professor Roesch remarked that students often find it difficult to see the reasons for certain types of experimental work which seem unrelated to current problems or developments in the automotive field. Like most engineering instructors, Professor Roesch has always stressed the necessity of fundamental work, the understanding of which will permit the engineer to find correct solutions to complex problems which he may encounter in future professional work.

Professor Roesch is the inventor and designer of several important devices in the automotive field, the most important of which arrived on the scene long before its commercial use was realized. This device, for which a patent was granted, provided for automatic spark advance that was controlled by the intake vacuum. The patent expired under the seventeen-year rule without commercial adoption. Had this patent been effective when the automatic spark feature was incorporated in motor design, Professor Roesch would be a rich man today. He designed a fuel-weighing machine and a precision spark-advance protractor, both of which are used today. During World War I he worked on cam design problems for subchasers and was supervisor of auto mechanics courses for the United States Army. Along with his teaching duties, at the Institute Professor Roesch has conducted certain research projects for the Armour Research Foundation. He acts as consulting engineer for the Sinclair Refining Company and the Buda Company as occasion demands and time permits.

Engineering society activities, especially those of the American Society of Mechanical Engineers and the Society of Automotive Engineers, take many hours of his time. For years he has been honorary chairman of the student A.S.M.E. group at the Institute, a member of the executive committee of the Chicago Section of the A.S.M.E., and a member of several professional committees. His activity in the S.A.E. began almost with his election to membership in 1914. He has been a member of the standards committee of the research division, chairman of the publications committee, member of the fuels and fuels research committee, vice-chairman of the tractor and industrial power equipment and Diesel engine group of the Chicago Section, and student committee chairman of the Chicago Section.

In 1921 the program committee of the S.A.E. had planned to have Sir Dugald Clerk, outstanding authority on gas engines, present his paper entitled "Cylinder Actions in Gas and Gasoline Engines" at the annual meeting. When it was learned that Sir Dugald would be unable to leave England to present his paper, because of illness, Professor Roesch was selected to abstract this paper and to expand upon the conclusions offered by this distinguished authority. In commenting upon the abstract, Sir Dugald paid high compliment to Professor Roesch.

He has written many articles covering all phases of engine testing for technical journals and for the *Engineer*. He has cooperated with the Chicago Public School System in developing automotive courses at the Vocational and Calumet High Schools.

Professor Roesch was one of the founders of the Pi Tau Sigma honorary mechanical engineering fraternity at the Institute. He is also a member of Tau Beta Pi, honorary engineering fraternity, and of the Society for the Promotion of Engineering Education. He is a member of the University Club of Chicago. His principal hobbies are fishing, golf and photography. He is married, has two children and resides at 2136 West 108th Place, Chicago.

ARTHUR H. JEMS

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## ANNUAL MEETING

Filling the 1100 available seats and occupying all standing room, over 1300 Illinois Tech alumni attended their annual general meeting and elected officers for their Association in the Grand Ballroom of the LaSalle Hotel last November 9th.

Highlights of the program were a report of the activities of the Alumni Association for the past year; a presentation to President Heald of a list of the workers for and contributors to the 1943 Alumni Fund; the report of the chairman of the nominating committee and the election of officers; and an address by Major Alexander P. de Seversky, international authority in the field of aeronautical engineering, on the subject of "Victory Through Air Power."

Opening the meeting with his annual report, George H. Von Gehr, E.E. '28, stated that during the past year five alumni clubs had been organized in cities throughout the country, increasing the total number of such clubs to fifteen. His report touched on meetings held by these clubs, activities of the Alumni Association's War Technologists Corps and cooperation with the American Arbitration Association. He told of the several large meetings held in Chicago by alumni, and of numerous smaller ones in connection with social, educational, and fund activities. In his report he also included figures concerning Illinois Tech alumni in the several branches of the Armed Forces, mentioning the fact that we have more than 1400 such alumni, which represents ten per cent of our membership.

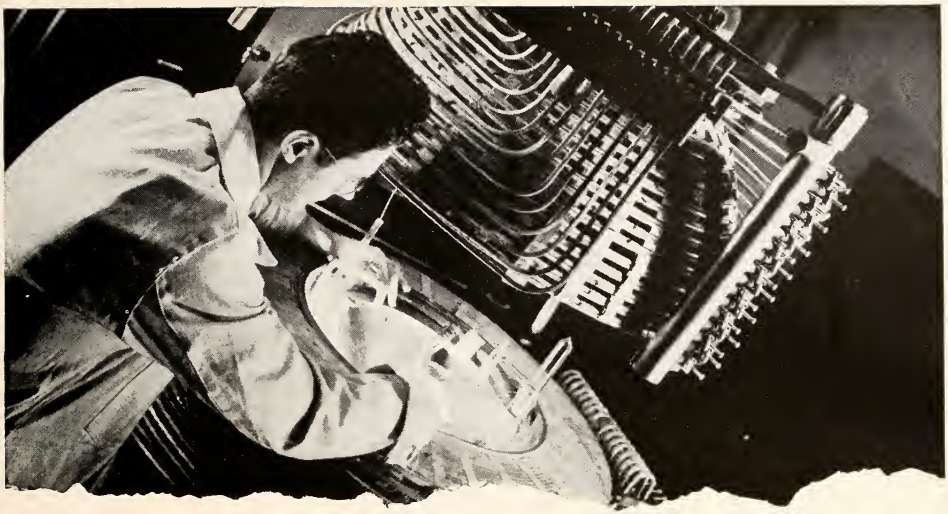
Kent H. Parker, F.P.E. '28, general chairman of the 1943 alumni fund, made his final report. A total of $40,405.90 was contributed by 2421 alumni. They were visited by 421 alumni fund workers. Mr. Parker presented a list of the alumni fund workers and contributors to President Henry T. Heald.

In his response to Mr. Parker, President Heald gave a brief account of recent and current happenings at the Institute.

Mr. John Sanger, M.E. '21, chairman of the nominating committee, reported for that committee. The large and representative group of alumni elected the following officers by unanimous vote: George H. Von Gehr, E.E. '28, was reelected president of the Association; Sidney B. Westby, E.E. '33, was reelected vice-president; Miss Mollie Cohen, A.S. '24, was elected secretary-treasurer, and Kent H. Parker, F.P.E. '28, was elected to the board of directors as representative from the College of Engineering.

Following the election of officers, Mr. Von Gehr introduced the speaker of the evening, Major Alexander P. de Seversky who presented a very stirring address on "Victory Through Air Power." Major Seversky spoke of the importance of engineers and scientists in the present war and of the fact that we must not underestimate Japan's industrial and military strength. He said that to defeat Japan we must bomb Japanese industry and so impair her war production that she will be incapable of continuing the war. He spoke of the post war domination of commerce and transportation by aviation, and said that the nation strongest in the air, both in a military and commercial way, would be able to maintain its position in the new post war world.

Representing Illinois Tech clubs in their respective cities, three alumni were present at this meeting. They were Mr. Edwin N. Searl, F.P.E. '35,



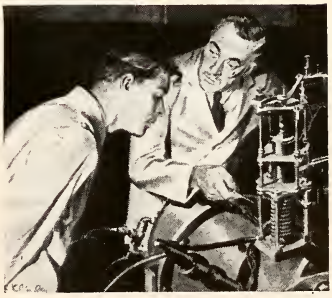
Helping the tire maker: Pictured here is a laboratory model of the new Westinghouse-developed "mass spectrometer," an adaptation of which analyzes gases with incredible swiftness and accuracy. Right now, one of the most important of its many uses is speeding up tremendously a step in the making of synthetic rubber.

## Westinghouse research accepts every wartime challenge . . .

Under the spur of war, Westinghouse research is delving into numberless mysteries, not only in the vast field of electricity and electronics, but also in chemistry, physics, metallurgy, plastics. And as a result, out of the great Westinghouse laboratories has come a steady stream of new war products, and new and better ways of making old ones.

## Westinghouse research develops new talent for America . . .

To Westinghouse, each year, come several hundred budding scientists and engineers—to work, to learn, to blaze new trails in electrical research. And each year, through more than 100 Westinghouse scholarships, young men enter America's engineering colleges to develop the native skill and talent that have made America great and will make it greater.





## Westinghouse research promises new wonders for peace . . .

You have heard much talk of the marvels science will offer you after the War. Well, there *will* be marvels—plenty of them—and Westinghouse research is working to contribute its full share. But we will never lose sight of what we consider our first duty: seeing that, beyond all question, each Westinghouse product, old *or* new, is the very finest of its kind. Westinghouse Electric & Manufacturing Co., Pittsburgh, Pennsylvania. Plants in 25 cities, offices everywhere.

president of the Illinois Tech Club of St. Louis, Missouri; Mr. West Shell, F.P.E. '15, president of the Cincinnati Illinois Tech Club; and Mr. Robert I. Wishnick, Ch.E. '14, chairman of the alumni effort committee for the New York Illinois Tech Club.

Among the highlights of the evening was the presentation of very fine and enjoyable music by the Illinois Tech Musical Clubs under the direction of Mr. O. Gordon Erickson.

A. E. WRIGHT.

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## 1898

SLAKER, HARRISON J., E.E. A., lives in Scarborough, New York, and is manager of the Scarborough Supply Company, Scarborough, New York.

## 1901

SKEER, TINA M., A.A. L., who was librarian of Lewis Institute for several years after Laura Benedict resigned, is now living at 55 West 11th Street, New York. New York.

## 1903

WILHOIT, FREDERIC S., E.E. A., has moved from Milwaukee, Wisconsin, to 11724 Otsego Street, No. Hollywood, California.

## 1904

WILCOX, WAYLAND D., A.A. L., is manager of Len & Febiger, 600 S. Washington Square, Philadelphia, Pennsylvania, and resides at Garden Court Plaza, Philadelphia, Pennsylvania.

## 1907

SMITH, CLARENCE U., M.E. A., is a consulting engineer, and his current address is P.O. Box 953, Lindsay, California. Mr. Smith also is manager of the Mt. Whitney Hotel, Lindsay, and the owner and operator of a forty-acre ranch for olives and oranges.

## 1910

WESSELHOEFT, Mrs. CHARLES (ELSA WINTERMEYER), A.A. L., has moved to 6128 S. Woodlawn Avenue, Chicago, Illinois.

## 1912

LINDBERG, WILLIAM A., E.E. A., was recently honored by his fellow employees in the Commonwealth Edison Company, 72 W. Adams Street, Chicago, Illinois, upon completing thirty years of service. He holds the position of development engineer.

Mr. Lindberg started his career with the Chicago utility as a service investigator, and later became an engineer in the distribution division. After serving as engineer of circuit design and service investigation for a number of years, he was appointed to his present post. His residence address is 507 Orchard Lane, Winnetka, Illinois.

## 1913

OGDEN, FRANK E., Ac. L., is vice-president of the Clinton Lock Company, Clinton, Iowa, and lives on Crescent Drive, Clinton, Iowa.

WALD, MAX D., M.E. A., has moved to 3085 Crescent Drive, Warren, Ohio.

## 1918

RUSK, COL. RALPH H., F.P.E. A., formerly of 811 E. State Street, Milwaukee, Wisconsin, is serving our country somewhere in India.

## 1920

POPKIN, JOHN L., A.A., is general manager and partner, The Electric Supply Company, 317 Bond Avenue, Grand Rapids, Michigan. His mailing address is R.R. No. 2, Ada, Michigan.

SHIPMAN, PAUL R., Ch.E. A., lives in Weston, Ohio, and is a machinist's helper for Baker Brothers, Inc., Toledo, Ohio.

## 1921

BALDWIN, MAJOR FRANCIS M., A.A., is post engineer officer at Fort Sheridan, Illinois. Major Baldwin enlisted in the Reserve Officers' Corps in the 30's, studying and passing his examinations for 2nd and 1st lieutenancies respectively, along with his civilian work, and in March, 1940, he received his commission as captain in the reserves. He entered active service in November, 1940, at Fort Sheridan, shortly after the passage of the Selective Service Act.

A promotion came to him in August, 1942, when he was commissioned major. He also received the American Defense Ribbon, awarded to those who had been in active service one year or more preceding Pearl Harbor.

Prior to his military service, he was assistant manager of the construction unit of the construction & equipment department of Montgomery-Ward & Company in Chicago, Illinois.

MALVIN, RAYMOND C., E.E. A., president of Malvin & May, Inc., 310 S. Michigan Avenue, Chicago, Illinois, is also general works manager for the Fitzgibbons Boiler Company, Inc., whose main offices are in Oswego, New York. He resides at 8220 Dante Avenue, Chicago, Illinois.

STEINER, ALBERT J., M.E. A., F.P.E. A.'36, has been appointed engineer in the protection department of Underwriters' Laboratories, 207 E. Ohio Street, Chicago, Illinois.

Assistant engineer in the department since he joined the laboratories' staff at Chicago in 1921, Mr. Steiner assumes the responsibility of heading the department. His home is at 2530 Farwell Avenue, Chicago, Illinois.

## 1926

DARROW, GEORGE L., E.E. L., is in the engineer corps.

## 1927

HINSHAW, JR., MARVIN V., Ac. L., writes that he recently moved from Chicago to Louisville, Kentucky. He sends his regards to Professor John H. Smale of the Lewis Division, Illinois Institute of Technology.

Mr. Hinshaw is owner of the Stebbins Grill, 412 W. Chestnut Street, Louisville, and resides at 1905 Spring Drive, Louisville, Kentucky.

SHERIDAN, JOSEPH U., M.E. L., a lieutenant in the United States Naval Reserve, writes that his new address is 1560 Ansel Road, Cleveland 6, Ohio.

## 1928

ALLEN, WILLIAM D., F.P.E. A., has recently been appointed special agent in Ohio for the National Fire Group with headquarters at Cleveland, Ohio.

Mr. Allen is a graduate of the Armour Division of Illinois Institute of Technology, and following his graduation spent three years with the Ohio Inspection Bureau in its Cleveland Office. He traveled the Ohio field as state agent and engineer for twelve years for the Pearl and Dearborn National.

His residence is at 20434 Almar Drive, Warrensville P. O., Shaker Heights, Ohio.

SMITH, ANDREW B., M.E. A., recently became principal surveyor of the Great Lakes department of the American Bureau of Shipping, with offices in the Rockefeller Building, Cleveland, Ohio.

## 1929

According to a recent news release, PFC ELWIN K. ROHR, F.P.E. A., has completed his course and graduated from the AAF Technical Training Command at Seymour Johnson Field, Rochester, New York. He has been named an instructor of future soldier-mechanics.

## 1930

CLARK, MAYNARD E., C.E. A., notified us of his change of address in a most pleasant letter. He writes:

Dear Sir:
Merely a notification of change of station and address (as given below) as requested by your office. Am pleased, exceedingly, to furnish the additional information that on September 3rd Miss Jean Kover, of Warren, Ohio, and I were married at Cumberland, Maryland. I know that she will be a welcome addition to the Tech family, and I look forward to presenting her to my old buddies from 3300 Federal.
Would appreciate present addresses of Morris Nelson and William Manske, both Armour C.E. '30, if available.
Thanks for all the past favors.
Sincerely,
Lt. Maynard E. Clark, C.E. A. '30
Assistant Post Engineer
Columbus A.S.F. Depot
Columbus, Ohio

## 1932

BROTMAN, ABE, C.E. A., a lieutenant, has been overseas a little over a year now, and is at present serving in England. He is in command of a unit laying out air fields for our flying fortresses.

DREVER, J. BRUCE, A.S. L., has recently moved to 910 Judson Avenue, Evanston, Illinois.

According to a newspaper clipping, LUCILE F. GRANT, H.E. L., has been appointed home economist for the Gas Company of San Diego, California. She was recently dietician for the Camp Lockett Station Hospital.

## 1933

STEINHAUS, ARTHUR L., F.P.E. A., a former inspector for the Fire Insurance Rating Bureau, 1 W. Main Street, Madison, Wisconsin, is now a lieutenant (j.g.) in the United States Naval Reserve and is in training at the Naval Training Station, Hollywood, Florida.

STETTNER, HOWARD W., M.E. L., is associate marine engineer for the Navy Department, Bureau of Ships, Washington, D. C. His residence address is 349 N. Granada Street, Arlington, Virginia.

The Security Insurance Group of Cleveland, Ohio announces the appointment of WALTER J. WELDON, F.P.E. A., as special agent for northern Ohio. Mr. Weldon was formerly employed for six years as an engineer with the Kentucky Actuarial Bureau. Since 1939 he has been associated with a large group of companies in a production capacity. He will make his headquarters in the Hanna Building, Cleveland, Ohio. He resides at 11 Carlton Drive, Willoughby, Ohio.

## 1934

ANDERS, ARCHIE, M.E. A., writes to tell us that he is now chief engineer of Ruskin Products Company, Inc., 5622 North Broadway, Chicago. He is also an instructor in mechanical drawing at Crane Tech. High School.

CLEVERLY, GLENN L., A.S. L., a lieutenant in the U. S. Army, is with the 1st Student Training Regiment Infantry School, Fort Benning, Georgia. His residence address is 218 16th Street, Columbus, Georgia.

DANKO, JR., MARTIN, E.E. L., writes that he is now a second lieutenant in the U. S. Signal Corps. He is attending Harvard University where he is continuing his study of electronics. Mail will reach him by addressing him as Lt. Martin Danko, Jr., c/o Hotel Continental, Cambridge, Massachusetts.

LEBUS, WILLIAM A., M.E. A., chief engineer for the Protectoseal Company of America, 1920 S. Western Avenue, Chicago, Illinois, has recently moved to 336 Selbourne Road, Riverside, Illinois.

PFLUM, RAYMOND J., C.E. A., is a lieutenant commander in the U. S. Navy. His residence address is 7945 S. Ada Street, Chicago, Illinois.

The following publication was received from the Headquarters of the Los Angeles Port of Embarkation, Intelligence & Public Relations Division, Public Relations Branch, Wilmington, California:

Corporal CARL H. SACHS, JR., F.P.E. A., son of Mr. and Mrs. Carl H. Sachs, Sr., of 6241 N. Claremont Avenue, Chicago, was one of the twenty-nine noncommissioned officers of the Headquarters Detachment. Los Angeles Port of Embarkation, who received Good Conduct Medals recently for demonstrated good character and efficient performance of duty over the past year.

Corporal Sachs is a fire prevention engineer in the Fire Marshal's Office at the port. He entered military service in May, 1942, and receiver his basic training at Camp Robinson, Arkansas. In civilian life Corporal Sachs was a fire prevention engineer for the National Fire Insurance Company of Hartford, Connecticut.

TEACHERSON, ANDREW G., E.E. L., has been assigned to duty outside the Continental United States. He is a lieutenant in the United States Naval Reserve.

## 1935

COLLINS, JOHN G., E.E. L., is a lieutenant with the 1105th Engr. Combat Group.

Clarence L. Clarke, Dean of Arts and Sciences recently received the following letter from EDWARD C. QUINN, A.S. L., Pharmacist's Mate 2/C in the U. S. Navy.

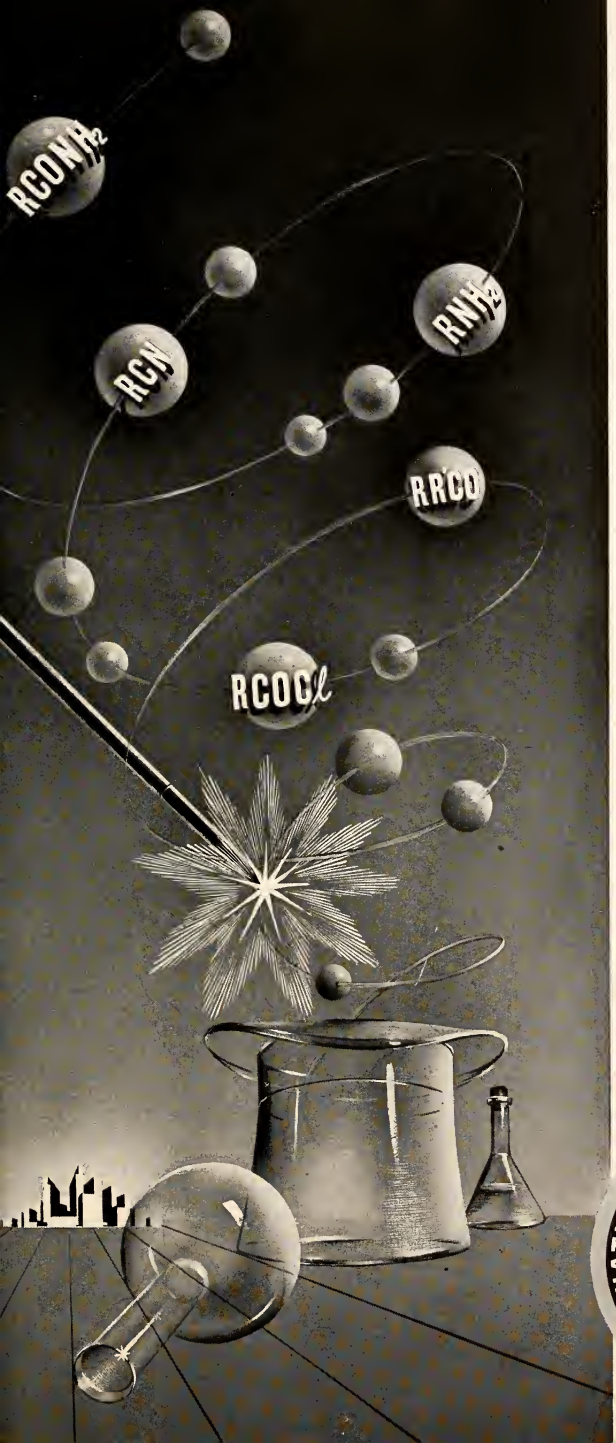
Dear Sir:
I've been carrying a McGuffy's reader a long ways from home. I remember your saying in class one day, that they were rare books. I'm sure it would mean more to you than to me so I've mailed it to you. It will probably be a month or so before you receive it. The only thing I can say is that the usual South Sea Isle associations are the "Pipe-dreams" of an "escapist". No, yes, scenery or peacefulness of life are all excellent props a la Hollywood. Far be it from me to criticize Hollywood; my God, I wish I were there.
I'm finishing the first month of what is usually an eighteen-month sentence on this rock. The "rock" is Alcatraz in technicolor—all green. When I get out I hope to visit you again.

Regards
ED. QUINN—PhM 2/C

## 1936

LISCHER, RICHARD P., A. A., wrote the following note.

Fellow Schoolmates:
Times seem to change faster than I can keep up with them. It seems just yesterday that I was another big noise on the campus. Today, I find myself a little noise in the General Electric Company—in fact I have been with them since Feb. 22, 1943. Am plugging away at Postwar Radio Design and I hope I don't flatter myself too much when I say that I think it'll be pretty good. Wonder what the rest of the fellows are doing. God knows there are not many left around Chicago. Might I ask you to change




# MODERN MAGIC

## starts with the "CD" chemicals

Magic is not confined to the prestidigitator's wand and hat. For in the vast new realm of tomorrow, magic starts in your research laboratories. It develops brilliant new materials and processes for richer living. And it begins with the "CD" Chemicals, produced in commercial quantities by the Armour Chemical Division.

The "CD" chemicals comprise . . . Amines . . . Amides . . . Nitriles . . . Ketones . . . in a wide range of alkyl chain lengths. The physical constants and chemical activity change gradually from one member of the series to the next. Melting points, boiling points, etc., vary widely and permit selection of those members best suited to your particular problem.

The amines are alkyl ammonias and the nitriles are non-toxic organic cyanides. The amides have high melting points and are thermally stable up to 170°C., while the ketones are very thermally stable and relatively inert chemically. Sample requests should be specific insofar as possible to avoid duplication of effort. A request on your company stationery will bring samples and complete information about these "CD" chemicals . . . forerunners and foundation stones of modern magic in your own laboratory.

**ARMOUR CHEMICAL DIVISION**

*Armour and Company*

1355 WEST 31ST STREET • CHICAGO



the old mailing address to Old Road, Southport, Connecticut.

Sincerely,
DICK LISCHER.

## 1937

SPIEGEL, HAROLD H., A.S. L., is a research chemist for Bell & Howell Corporation, 7000 McCormick Boulevard, Lincolnwood, Illinois.

Mrs. Harold Spiegel graduated from the home economics department at Lewis Institute in 1937.

WOLFF, CHARLES E., A.S. L., a warrant officer, is now serving in the U. S. Army somewhere overseas.

## 1938

BRAY, WILLIAM T., A.S. L., is a captain with the U. S. Marine Corps and is serving somewhere in the Southwest Pacific.

CREWS, JR., OSBORNE P., A.S. L., an instructor for the Air Corps Technical School, resides at 408 East White Street, Champaign, Illinois.

According to a recent newspaper article received by the Alumni Office, Pilot Officer EDWARD L. GIMBEL, A. Eve. Div., of 2245 N. Laramie Avenue, Chicago, Illinois, one of the few Americans still with the Royal Canadian Air Force, and a veteran of the Dieppe raid, has been awarded the Distinguished Flying Cross. Gimbel joined the R.C.A.F. in 1940, and since being sent overseas has participated in more than seventy operational trips over enemy territory.

He is officially credited with having shot down three enemy fighters, and probably destroyed or damaged three more.

OSBORNE, MURIEL E., H.E. L., is an Army Nurse and is located at Scottville, Illinois.

## 1939

ANDERSON, ZOE E., A.S. L., is now serving with the WAVES. Mail may be sent to her by addressing it to c/o Mrs. R. T. Meyer, 727 Waukegan Road, Deerfield, Illinois.

According to a newspaper article, CLAUDE T. GORDON, A.S. L., has completed his eleventh year as principal of the Englewood Y.M.C.A. Summer School, 6545 S. Union Avenue. During the winter school term Gordon is principal of Drexel School in Cicero. He resides at 1118 S. Oak Park Avenue, Oak Park, Illinois.

JAFFEE, ROBERT L., Ch.E., A., has been appointed to the technical staff of Battelle Memorial Institute, Columbus, Ohio, where he will be engaged in nonferrous metallurgical research. Dr. Jaffee recently was associated with Leeds & Northrup Company, Philadelphia, Pennsylvania.

Private DAVID A. YOUNG, JR., A.S. L., new mailing address is Headquarters 381, Camp Adair, Oregon.

## 1940

MARX, WILLIAM, M.E. L., is a private in the Engineer Corps.

A recent newspaper article relates some of the experiences of JOHN M. MENCZKOWSKI, Le, a first lieutenant in the Army Air Forces. The article taken from the Chicago Daily Tribune reads as follows:

A Chicagoan who was in a plane on Hickam Field, near Honolulu, on the morning of Dec. 7, 1941, when the Japanese bombers came over, yesterday described some of his experiences in Pacific war theaters.

He is John M. Menczkowski, 25 years old, a first lieutenant in the Army Air Forces and a son of Mr. and Mrs. John Menczkowski of 3751 Irving Park Road. He was a draftsman and designer of commercial metal products before he joined the army in October of 1940. He and a friend were in a plane preparing to take off when the Japs struck at Pearl Harbor and Hickam field. They thought it was part of the war games until they saw bombs fall and the roof of a hangar rise into the air. They left their plane, which was unarmed, and saw the Japs destroy planes on Hickam field and ships in Pearl Harbor. During that day of flame and horror, Menczkowski helped extricate the dead and wounded and set up machine gun emplacements.

When the war moved into the western and southwestern Pacific, Menczkowski went with it. He was a navigator and one of the tasks of his outfit was to find enemy convoys at sea and radio details back to an American base. Once, after one of these reports, American naval vessels went out and sank five Jap destroyers in a single convoy.

He wears the silver star for gallantry in action, the distinguished flying cross, the air medal, and the American and Asiatic campaign ribbons.

SEVERSON, ELEANOR M., H.E. L., is an Army Nurse and can be reached by addressing her mail to Station Hospital, Hammer Field, Fresno, California.

STEDMAN, LAWRENCE B., M.E. A., has completed 50 air missions against the enemy according to a recent newspaper article taken from the Chicago Daily Sun. Staff Sergeant Stedman, who, as a waist gunner, took part in the first Rome raid, found the one over Foggia, Italy, tougher, because of heavier air opposition. Stedman is the holder of the Air Medal with ten Oak Leaf Clusters.

## 1941

BLAIDA, ANDREW S., M.E. I., an Army lieutenant, is on duty overseas.

Private First Class JACK W. DZIERZ, A.S. L. is stationed at Co. B., Bks. 234, 108 General Hospital, New Orleans, Louisiana.

LYKOWSKI, GEORGE S., C.E. I., has been commissioned a lieutenant in the United States Army Air Corps from the Technical School, Army Air Forces Technical Training Command, Yale University, New Haven, Connecticut.

BAUER, NORMAN T., Ie., is a private in the United States Army. His mailing address is F Btry.—Enlisted Student Group School Brigade—AA School, Camp Davis, North Carolina.

TANNEHILL, ROBERT E., Ch.E. I., wrote the following letter to the Alumni Office:

Gentlemen:
I finally have a more or less permanent station so I thought I would write and have my address changed so that I can receive the school publications. My present military address is the following:

PFC Robert E. Tannehill, 16170849
Co. "E," A.S.T.U. 3871
Louisiana State University
Baton Rouge, Louisiana

I took my basic training at Camp Sibert, Alabama, in the Chemical Warfare Service. After finishing training there I was selected for the Army Specialized Training Program of Alabama for classification. Since I studied chemical engineering at Armour I was classified as an advanced chemical engineer. While I was waiting to be assigned to a college however, the army decided that it had enough chemical engineers and I was reclassified as an advanced mechanical engineer and assigned to Louisiana State University. Here I am expected to complete the regular curriculum in mechanical engineering in nine months. I hope I can do it.

Frank J. "Spike" O'Donnell, Ch.E. I. 43, managed to stick with me through basic training. He is now studying basic engineering at Heidelburg University at Tiffin, Ohio. I haven't had a furlough yet, but when I finish my training here I hope to get one and will drop around and see my friends at Armour. Until then, I remain

Sincerely yours,
PFC ROBERT E. TANNEHILL.

## 1942

DEGIORGI, JERRY, M.E. I., informs us that he is for the present stationed in Seattle, Washington, as a member of the Army Air Forces and is attending the Boeing B-29 School. Upon completion of the course he will be sent to Flight Engineering School in Salina, Kansas. Previous to receiving his commission as 2nd lieutenant in the United States Army Air Corps he spent seventeen weeks cadet training.

MINWEGEN, JR., ART, C.E. I., wrote the following letter to Mr. Wright, executive secretary of the Alumni Association:

Dear Art:
In case you have not been notified direct by the two Minwegens, will you kindly change your records on Arthur P. Minwegen, 916 John Street, Sault Ste. Marie, Michigan, to—

Ensign Arthur P. Minwegen
Platoon No. 199, Brks. E2-56
Camp Peary, Virginia

The "Little Fella"
Pvt. Peter A. Minwegen
ASN 16170620
Co. "C", 3rd Platoon, 63rd Trng. Bn.
13th Trng. Reg., Camp Fannin, Texas

You might also be interested to learn that a week ago Sunday there was a reunion of four members of the Class of '42 in Williamsburg where Camp Peary is located. Milt Pleva, C.E. I '42, and Frank Jenscins, M.E. I '42, came up from Norfolk, Virginia, to spend the day with Bob Sundstrom, C.E. I '42 and Art, Jr., and if I know our Armour men, a great time was had by all.

Will you kindly change your mailing records accordingly, and at the same time I would like to send my kindest regards and best wishes.

Yours very truly,
ART MINWEGEN.

## 1943

HERTEL, DAVID H., A.S. I., is a naval aviator in the U. S. Navy and is stationed at the Naval Air Facility, Columbus, Ohio.

ZIMMERMAN, JUNE F., A.S. I., has been elected to the Electro-chemical society at Columbia University, New York. Miss Zimmerman is doing research with the Crane Company of Chicago, where she is working on the problem of corrosion in the field of thermodynamics and physical chemistry.

## 1944

SWANSON, ALBERT D., M.E. I., an aviation cadet, is receiving his basic flying training at Enid Army Air Field, Enid, Oklahoma. His home address is 10986 Church Street, Cbicago, Illinois.

THORNTON, LIEUTENANT JOHN C., M.E. I., is a fighter pilot with the U. S. Marine Corps in the Pacific area.

RHODES, WARREN J., A.S. I., has been assigned to the University of Illinois, Champaign, Illinois, for the Army Specialized Training Program. His home address is 922—5th Street, Aurora, Illinois.

## 1945

ANDERSON, J. MILTON, A. I., who is "Somewhere on an island in the South Pacific Area," writes:

Dear Sir:
While I was in Australia, I received a letter which was forwarded from my home address to my base in Australia. Since then I have left Australia and I am now on an island somewhere in the South Pacific Area. I was indeed surprised to hear from my old tramping grounds. I sure would like to be back in school now.

At the present time I am in the Plans & Training Section of our battalion. I am working as a draftsman in this (S-3) section. I can truthfully say that my work fits in perfectly with the course of study which I was taking when I attended I.I.T. back in '42 (Architectural Engineering). I have had many instances where my training was of utmost use. I'm thankful for this education which I received back at I.I.T. Mr. Danforth, Engineer Instructor in Architectural Engineering, was one who was the main factor for my progress in the "drafting" game. I owe much to him.

The natives on this island are called "Fuzzy Wuzzys," and they do most of the manual labor. The reason for this is because they can stand the heat much better than the white man. Since the tropical heat is really strong, I'll just close this little letter and take a short dip in the ocean.

If I can be of any service to you in some way (while overseas), please write and let me know. I could write and tell you of many important engineering feats which we have accomplished, but I'm forbidden to do so. So until our return to the states again—Good Luck in your work.

I remain,

T/CPL. JOHN M. ANDERSON.

(My name in the books at I.I.T. is J. Milton Anderson. Change is due to Army regulations.) P.S.: Greet all—from one of I.I.T.'s fellow engineers!

LOMBARDO, JOSEPH S., M.E. I., who has been in the Army since January 27, 1943, is at present on maneuvers in Nashville, Tennessee. His mailing address is 19th Chemical Maintenance Company, A.P.O. No. 402, c/o Postmaster, Nashville, Tennessee.

## 1946

COFFER, PFC JOSEPH M., A.S. I., is at the Ontario Army Air Field, Ontario, California. His home address is 312 N. Central Avenue, Chicago, Illinois.

SEIDELL, CORPORAL RICHARD, E.E. I., has a new address. It is now S.T.A.R. Unit 3964, Co. C, Santa Rosa College (Jr.), Santa Rosa, California.

STILES, JR., HARRY C., A.S. I., A.S.N. 16172212, is with the 24th AAF Band at Sheppard Field, Texas.

# ENGAGEMENTS

## 1935

Mr. and Mrs. Louis H. Debs of East End Avenue, Chicago, announce the engagement of their daughter, Betty Jane, to Ensign WALTER H. SOBEL, A.A., son of Mr. and Mrs. Karl B. Sobel of Melrose Street, Chicago. Ensign Sobel is serving somewhere in the Pacific.

## 1936

The engagement of Virginia Ann Doulberry to HERBERT S. ARNOLD, E.E. A., both of New York City, has been announced by her parents, Col. and Mrs. Frank R. Doulberry of Tucson, Arizona. Mr. Arnold is now employed with the Bell Telephone Laboratories in New York City. No date has been sent for the wedding.

## 1940

KOZACKA, RICHARD J., A.S. I., who has become engaged to DOLORES J. ZOIERZKO, A.S. I 45, is employed by Monsanto Chemical Company of St. Louis, Missouri. Mr. Kozacka's father is on the faculty of Illinois Institute of Technology.

## 1942

Mr. and Mrs. J. J. Kennedy, 7106 Lafayette Avenue, Chicago, have announced the engagement of their daughter, Dorothy, to Ensign ARTHUR MINWEGEN, C.E. I., son of Mr. and Mrs. A. H. Minwegen, 5940 N. Fairfield Avenue, Chicago.

## 1943

Mr. and Mrs. Chester A. Harris, 811 Washington Street, Evanston, have announced the engagement of their daughter, Margaret, to

## *We know what's happening on your campus*

## *Here's what's cooking on ours*

We're very much aware of what you are doing.

It's because we are grateful that we want to tell you this.

You've never known industry—not really well. It's probably still a vague place that makes things you buy. You probably think of us as just a place aluminum comes from . . . the aluminum that makes the planes you are going to work with.

But we're people—fathers and older brothers, mothers and sisters, doing the most interesting work we know.

When you come back you'll see this other side of industry. You'll see people figuring out what they can do to make a better world, and you will want to join them, doing something to make the peace rich and worth the fight.

There will be a great many things to be done. A lot of them will be done with aluminum.

Think of all the things the world is going to want in a hurry. A great deal of them will be shipped by air. So they'll be as light as possible. That's one reason why they'll be aluminum.

Millions of things are waiting for someone to make them lighter or more resistant to corrosion, brighter, prettier, cheaper. They'll be made of aluminum, too.

None of that can start till the war's over. But just as soon as our wartime job is done, we mean to make aluminum make a lot of jobs.

And that's what's cooking on our campus. We're studying right now ways of making those jobs. Some of them, we hope, will be right here at Alcoa Aluminum. Still more will be in industries using aluminum for the first time. Wherever they are, they should be exciting.

*A PARENTHETICAL ASIDE: FROM THE AUTOBIOGRAPHY OF*

ALCOA ALUMINUM

• This message is printed by Aluminum Company of America to help people to understand *what we do* and *what sort of men* make aluminum grow in usefulness.

Robert Langewisch, M.E. I., son of Mr. and Mrs. William H. Langewisch, 1624 Washington Street, Evanston. Mr. Langewisch is in the employ of the Appleton Electric Company in Chicago.

## MARRIAGES

### 1925

Major Louis S. Green, F.P.E. A., of Kansas City, Missouri and Lieutenant Mary E. Chaplin of Falling Spring, Virginia, an army nurse, were married in September, 1943, somewhere in New Guinea where both are serving, according to an Associated Press Dispatch. The wedding took place in the small office of the chaplain and the newlyweds were given a leave for a honeymoon in Sidney, Australia. Lieut. Col. Ernest D. Elliott of Hammond, Louisiana, performed the ceremony. Col. John Crehan of Brookyn gave the bride away, and the best man was Lieut. Robert Newsome of Rapid City, South Dakota. Native flowers covered the bridal path and were draped over the door of the chaplain's office. Two other army members supplied the music for the ceremony.

### 1937

Mr. and Mrs. J. R. Dandridge have announced the marriage of their daughter, Essie Mae, to Eugene G. Ciechanowicz, C.E. A., son of Mr. and Mrs. Francis Ciechanowicz of Chicago.

### 1938

On September 4, 1943, Miss Jean Shirley Frye became the bride of Willis G. Labes, F.P.E. A. The Rev. Fr. Jordan officiated. The ceremony was performed at St. Cecilia's Church in Peoria, Illinois. Mr. Labes is a fire protection engineer representing the Factory Insurance Association of Chicago. Mr. and Mrs. Labes will make their home in Peoria after returning from their wedding trip.

### 1940

A recent newspaper article from Washington, D. C., reads as follows:

Of interest here is the recent marriage of Miss Phoebe M. Hargy of College Park to John H. Kuck, M.S. A., the son of the late Mr. and Mrs. Julius A. Kuck of Albion, New York.

The bride is the sister of Capt. Francis R. Hargy, U.S.A., who is now overseas. She is well known in the Capitol and Prince George's County for her work with the Girl Scouts. The bridegroom is now with the John Hopkins University.

The couple will make their home at 7444 Georgia Avenue, N.W., Washington, D. C.

Mr. and Mrs. Russell F. Sherman announce the marriage of their daughter, Shirley, to Ensign Donald H. Sunde, F.P.E. A., on Saturday, the eleventh of September, 1943.

### 1941

On September 5th, Biagio J. Nigrelli, M.E. I., was married to Miss Geraldine Kozlowski at Saint Viator's Church, 4170 West Addison Street, Chicago, Illinois. Mr. Nigrelli is employed by the Delta-Star Electric Company of Chicago.

### 1942

Mueller, Roger J., M.E. I., on September 11th married Miss Shirley Lanten at "The Country Church of the City", Granville at Lakewood, Chicago, Illinois.

### 1943

Mr. and Mrs. Alfred H. Kirkland of Elgin have announced the marriage of their daughter, Elizabeth A., to William S. Brown, Jr., A.S. I., son of Dr. and Mrs. William S. Brown, also of Elgin. Rev. William Rainey Bennett, pastor of the Universalist Church, officiated at the ceremony which took place at the Kirkland home. Mr. Brown is a chemist at Elgin State Hospital. When they return from a honeymoon, the young couple will live in Elgin.

The day Daniel J. Regan, Ch.E. I., was commissioned an ensign in the United States Naval Reserve at the University of Notre Dame, he took as his bride Miss Margaret Donovan of 7146 Champlain Avenue, Chicago.

## MISSING IN ACTION

### 1941

Berry, Alexander R., C.E. I., a lieutenant in the U. S. Marine Corps, has been missing in action for the past eight months. His mother resides at 3242 N. Overhill Avenue, Chicago, Illinois.

### 1943

Burton, John F., A.S. I., pilot of a fighter plane, has been missing in action in North Africa since May 13, 1943. His father resides at 105 S. Wesley Avenue, Oak Park, Illinois.

## OBITUARIES

### 1895

Vaughan, Leonard H., Ac. A., president of Vaughan's Seed Store in Chicago, died on September 12, 1943. He resided in Western Springs, Illinois.

### 1903

Hutchins, Helen S., A.S. L., passed away on September 8, 1943. She resided at 1901 W. Monroe Street, Chicago, Illinois.

### 1907

Rowe, Hugh I., E.E. A., passed away on April 1, 1943. He resided at 802 W. Paterson Street, Flint, Michigan.

### 1927

McCord, Marie E., D.E. L., died on October 4, 1943. She resided at 3817 N. Lawndale Avenue, Chicago, Illinois.

### 1929

Gervase, Pauline M., A.S. L., passed away on October 4, 1943. She resided at 527 S. Millard Avenue, Chicago, Illinois.

### 1942

Andersen, Andrea K., M.E. I., a lieutenant in the United States Army Air Corps, died recently in England. Mr. Anderson resided at 4300 N. Hamlin Avenue, Chicago, and worked for the Electro-Motive Corporation, La Grange, Illinois, before enlisting in the Air Corps.

Perkins, John, A.S. I., a lieutenant in the United States Army Air Corps, reported missing in action some months ago, has been reported killed in action. He was shot down in a raid over France. His home address was 7644 S. Sangamon Street, Chicago, Illinois.

### 1943

Lieutenant Martin A. Mongeau, Jr., M.E. I., 22 years old, pilot of a Mitchell medium bomber was killed August 18th in the Pacific area. His parents, who live at 8131 Vernon Avenue, Chicago, were informed by the War Department. Lt. Mongeau enlisted in the Air Forces June 21, 1942, and received his wings last February.

Ensign Harry G. Storey, M.E. I., was killed in a plane crash near Fentress, Virginia, it was learned by his parents, Mr. and Mrs. Harry B. Storey. Ensign Storey entered the Service in August, 1942. He was trained at the Glenview Naval Air Station before he was assigned to the Norfolk Naval Air Station.

## OBITUARY

### BERNARD E. SUNNY

Four times in recent months, Illinois Institute of Technology has mourned the death of a valued member of its Board of Trustees. Our October issue reported the passing of three. On October fifth, Bernard E. Sunny died, full of years and honors. He was eighty-seven years old.

Mr. Sunny has been called the father of telephone service in Chicago. Beginning as a messenger for the Atlantic and Pacific Telegraph Company, he became president of the old Chicago Telephone Company, and later president of the Illinois Bell Telephone Company.

At the time of his death, he was a director of the latter company, and of the General Electric Corporation, the First National Bank of Chicago, the Public Service Company of Northern Illinois, and Wilson and Company. For five years he was vice-president of the South Park Commissioners. For many years he was a trustee and a most active member of Central Church.

Mr. Sunny's interest in Armour Institute of Technology began with the founding of the college, and we have been grateful to him for much help and advice. He established the Sunny scholarship in 1909. In 1908 the Institute conferred on him the honorary degree of Doctor of Engineering.

## DEAN ALDERSON

Dr. Victor C. Alderson, Professor of Mathematics and Dean of Armour Institute when it was established in 1893, was afterward President of the Colorado School of Mines. For several years he has been in retirement. The accompanying note to President Heald is an interesting message from the oldest to the newest of our administrations, separated by a half a century, but joined in good will and enthusiasm for the Institute.

Dear Dr. Heald,

Please accept my thanks for your thoughfulness in sending me a copy of your annual report.

It takes me back to the day when Dr. Gunsaulus and I sat on a box in the basement of the Institute building. The Institute itself was complete, in all detail, but with no equipment, no furniture, no faculty —just a skeleton. Dr. Gunsaulus wrote on the back of an old envelope my appointment as Professor of Mathematics and Armour Institute was born.

Now all of the pioneers have passed away, leaving me the only survivor.

I am mightily pleased at the success you have achieved and I am sincerely proud of you.

Faithfully always,

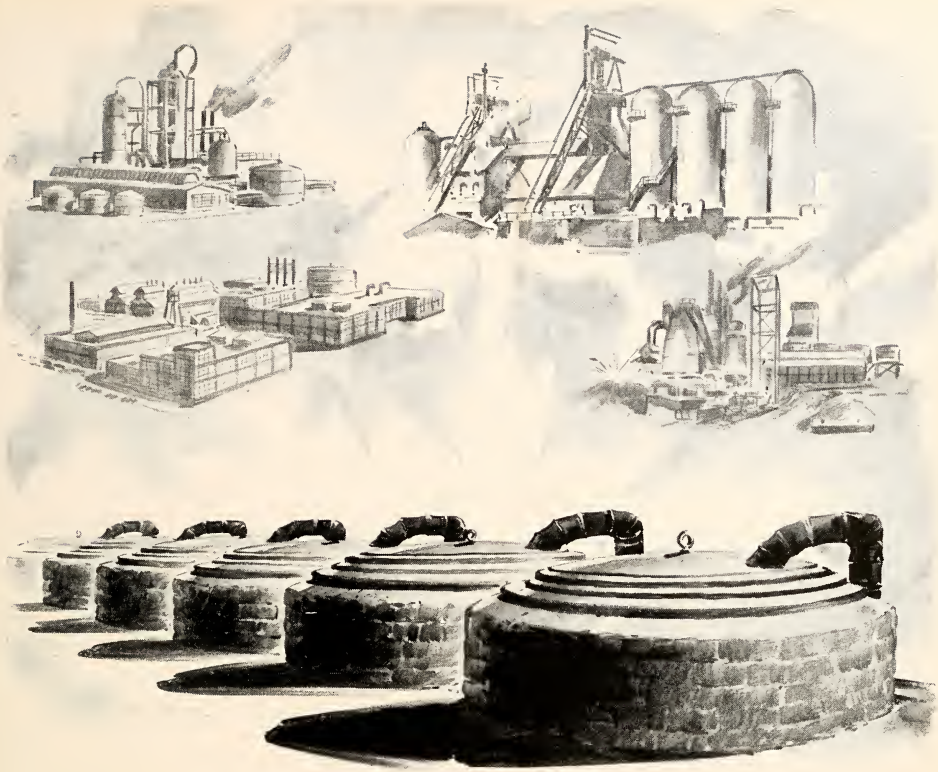
Alderson.

November the fourteenth.

## ENGINEER STAFF

Mrs. Lee C. Higgins, business manager of the *Engineer and Alumnus* for nearly three years, has resigned because her home in the future is to be in New York. Members of the staff appreciate her efficient handling of our problems of advertising and distribution.

Mrs. Higgins is succeeded as business manager by Miss Lucille Myers, who comes to us from previous duties in the office of the treasurer of the Institute.



## *CAUSTIC SODA—a key chemical in industrial growth*

Caustic Soda is an indispensable chemical needed by industry in huge quantities. A long list of products—notably petroleum, soap, paper and textiles—use it as an essential material in various manufacturing processes. The production and availability of this hard-working chemical are consequently of genuine importance.

Following the course dictated by its own initiative, Dow began many years ago to specialize, step by step, in the chemistry of brine. Original methods for the production of bromine led to chlorine, and the process for making chlorine produced caustic soda as a co-product. During the intervening years, Dow has become one of the leading producers of this key chemical, with plants so strategically located that they are prepared to serve the entire nation.

This development is cited merely to emphasize the importance of self-reliant enterprise.

**THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN**
New York • Cleveland • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

DOW

CHEMICALS INDISPENSABLE
TO INDUSTRY AND VICTORY

## FARM CROPS

(From page 15)

minerals, to paper, made from wood, an annual crop, would equal the tonnage of newspapers, the stock of which is still largely imported in the form of newsprint from Canada. The war demand for paper is now limiting the use of wood pulp for milk packages, but this check in chemurgic development is but temporary.

Until recently practically all cigarette paper consumed in the United States was imported from France, where a number of mills concentrated on the production of the material for this country. These mills employed linen rags as their raw material, most of which was imported into France from Russia, Poland and Balkan countries. Linen rags originated from flax. Flax has been grown in this country since early colonial days, but has, as a fiber, practically disappeared. With the building of a cigarette paper mill in North Carolina which made its first run on September 3, 1939, the day the European war started, a new market has been opened for flax straw. The consumption of flax fiber by the cigarette paper industry has shown a marked increase year by year; already the North Carolina plant has been expanded fifty percent. There are possibilities for using this paper-stock fiber in other lines of paper manufacture, and the amount consumed by the paper industry as a whole will increase gradually throughout the years.

In a short but busy decade our soybean crop has reached large proportions. What is being done with soybeans can be and will be done with all of our crops which produce fermentable starches and sugars; which contain fibers of cellulose, whether they are cotton or wood or hemp or flax; which are rich in proteins for plastics and oils for paints. And there will remain new crops to be grown on millions of acres, crops which have kept foreign labor busy while our own workers looked for jobs, such as the tung trees along the Gulf Coast, cork which comes to us from war ravaged Spain but which should be an important U. S. crop, pyrethrum for insecticides which we can easily grow at home, tannins needed to make our leathers which should be a domestic instead of an imported crop, flax and hemp fibers which our own farmlands will produce in ample volume whenever we decide to make our own linens and cordage instead of going to Asia for jute, Mexico for sisal, and Ireland for linens.

And yet, in spite of all the new things we are learning about food values, industrial needs, the importance of essential oils and pharmaceuticals and how to get the most out of our crops in barn and pastures, agriculture is spending far less money on research than is industry. Important research studies are under way all over the world. The results of research are no doubt in part responsible for the situation in Europe today, for many of the essential needs for soldiers at the front, and the people back home, have been developed in research laboratories. Only a few years ago Dr. Frederich Bergius, the great German scientist, winner of a Nobel prize, and the discoverer of the process for making gasoline out of coal and alcohol from wood, told us when he visited the Chemurgic Council offices in Dearborn, Michigan, that the next time Germany went into a war her people at home would not go hungry, for, as he bluntly put it, "We will eat our trees," and just before the war broke out we had another German visitor who proudly told us that before he left Berlin he gave a dinner to twenty of his colleagues at which everything served was made from wood.

I do not refer to these boastful, though yet scientifically possible statements in any prophetic mood. We are not going to eat our trees in this country. We shall never need to go beyond the products of our fields and pastures for our food supply. I refer to the work of the German scientists simply as an illustration of what is coming out of research laboratories.

Twenty-five percent of all labor in domestic production today is working at jobs which did not exist at the close of the last great war. There is no doubt in my mind but that twenty years from now twenty-five percent of our factory workers will be busy producing things which we now know nothing about. Of all the industries which have gone forward during the past few decades, the chemical industry has made the greatest progress, and that progress has come out of the research laboratories. The chemical industry as a whole spends about two percent of its gross sales revenue on research. On of the greatest of its companies has, since it was founded, spent a hundred million dollars in improving old products and discovering new ones. Today it spends almost four percent of its gross sales revenue on research. Agricultural research, and by that I mean all the activities of the state experiment stations, the land grant colleges and the government laboratories, spends only one-seventh of one percent of the value of agricultural products on its research programs.

The four regional research laboratories of the U. S. Department of Agriculture were authorized by Congress to search primarily for industrial outlets for farm products. While at present all the activities of the thousand chemists, physicists and engineers who staff those great laboratories are centered on war production we can safely look to them to serve the nation, when war no longer compels their service, in many ways now unknown to us.

Perhaps the best story of chemurgic progress was told in a recent issue of *Babson's Reports* which, under the caption "Chemurgy — The Farmer's Best Friend," said:

> Chemurgy had its beginnings in the thought that since food demand is limited by population numbers and stomach capacity, non-food uses for farm-grown raw materials should be increased. Progress has not robbed the movement of this sound fundamental. In fact, as non-food markets can be increased, the quantity of farm production can be enlarged; as such markets expand, acres can be turned to non-food purposes and relax the pressure of their surplus production in the food markets. Then with the farm markets in good shape, the normal processes of reducing costs by higher efficiency will naturally follow.
>
> In their four-syllable way the scientists are saying: "The surface of Chemurgy has hardly been scratched." From Main to Wall Street, Chemurgy is playing its part. To the farmer, it spells diversification. To the businessman, it means reduced costs. To the investor, it enlarges profitable opportunities in the biggest and best chemical companies. To the consumer, it promises a host of new things within his pocketbook range. To all, it proclaims Progress has no end!

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## SEMANTICS

(From page 17)

perfect objectivity. But despite his good intentions, he will often find, if he can be honest with himself, that he is far from doing what he promised himself to do. He is still influenced in his judgment of persons and issues by irresponsible name-calling, and he may even be indulging in a little careless name-calling of his own.

But these obvious facts can be put to use by the individual who really makes an effort to apply them. It is

# Submarine hunt in the Chemung Valley...



NO, it isn't a gun or a new style bomb. It's all we can show you of a special glass tube that is part of our secret submarine listening apparatus.

The same kind of tubes are used in listening devices that can pick up the menacing hum of an enemy plane miles away. And they're made out of special glass, to exacting requirements, by skilled Corning workmen in the peaceful Chemung Valley in Southern New York State.

Did we say "peaceful"? That isn't exactly correct. No subs actually prowl the Chemung, but there's plenty of warlike activity going on at Corning Glass Works, just as in every glassworks in the whole United States.

For Corning, like other glassmakers, was ready to turn its skill and experience to our country's use before the smoke had cleared at Pearl Harbor. For example, since World War I, Corning has developed medical and chemical glassware that frees this nation from dependence on foreign imports. This material is now flowing in a steady stream to industry, hospitals, and laboratories.

Hundreds of other items are made by Corning to aid the war effort. Optical glass, insulators for planes and tanks and ships, heavy glass parts for the manufacture of explosives, even glass precision gauges (ring, plug and others). Many of these jobs represent new uses for glass, where glass replaces metals because it is strong, resistant to wear and corrosion, and fairly plentiful. After the war many of these uses will stay, and new ones will be added because glass is a material of endless possibilities. And then, as now, Corning will be the center of American glass research.

In your own future as an engineer, *keep your eye on glass!* Corning Glass Works, Corning, New York.

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especially easy for our engineering students to do so, since their technological training inculcates a hearty respect for fact and a distrust of hasty generalization. They have only to be taught to carry over their scientific orientation from physics and chemistry to the problems of human engineering in its largest sense. It is important that they learn to make this transfer, since it is their destiny to be not merely the designers and operators of machinery but also the leaders of their communities in this increasingly technological civilization of ours.

Today more than ever, a knowledge of the limitations and potentialities of language is indispensable, and for the led quite as much as for the leaders. As Professor Hayakawa points out in the introduction to *Language in Action*, the modern American is constantly subjected to the influence of words:

"From the moment Mr. Smith switches on an early morning news broadcast to the time he falls asleep at night over a novel or a magazine, he is, like all other people living under modern civilized conditions, swimming in words. Newspaper editors, politicians, salesmen, radio comedians, columnists, luncheon club speakers, and clergymen; colleagues at work, friends, relatives, wife and children; market reports, direct mail advertising, books and billboards—all are assailing him with words all day long. And Mr. Smith himself is constantly contributing to that verbal Niagara every time he puts on an advertising campaign, delivers a speech, writes a letter, or even chats with his friends."

And, as Dr. Hayakawa goes on to say, the individual is profoundly influenced by the words which he hears at any particular time and by his linguistic attitudes which have been developed more or less haphazardly by a lifetime's experience in his highly verbalized environment:

"Whether he realizes it or not, however, Mr. Smith is affected every hour of his life not only by the words he hears and uses, *but also by his unconscious assumptions about language.* These unconscious assumptions determine the way he takes words—which in turn determines the way he acts, whether wisely or foolishly. Words and the way he takes them determine his beliefs, his prejudices, his ideals, his aspirations—they constitute the moral and intellectual atmosphere in which he lives, in short his semantic environment. If he is constantly absorbing false and lying words, or if his unconscious assumptions about language happen to be, as most of our notions are that have not been exposed to scientific influence, naïve, superstitious, or primitive, he may be constantly breathing a poisoned air without knowing it.

"What this book hopes to do is to present certain principles of interpretation, or semantic principles, which are intended to act as a kind of intellectual air-purifying and air-conditioning system to prevent the poisons of verbal superstition, primitive linguistic assumptions, and the more pernicious forms of propaganda from entering our systems. These poisons, if unchecked, wastefully consume our energies in the fighting of verbal bogeymen, reduce our intellectual efficiency, and may ultimately destroy our mental health and well-being."

Since the publication of his book, Dr. Hayakawa has been reaching an ever widening audience. He has contributed to a number of magazines and professional journals and has been in great demand as a speaker. He has lectured at the School of Modern Design in Chicago, at the Paper Institute in Appleton, Wisconsin, at the Menninger Clinic of Kansas City and at Pennsylvania State College, Syracuse University, and a number of other institutions of higher education.

He has been made Editor of *Etc., a Review of General Semantics,* a quarterly magazine which is the official organ of the Society of General Semantics. He has established his editorial headquarters in the suite of offices in Chapin Hall occupied by our Department of Language and Literature and has enlisted as his assistant editors Dr. Henry J. Webb, and Mr. Edgeley Todd, instructors in the English Department. Count Korzybski and Miss M. Kendig, Associate Director of the Institute of General Semantics, are serving as Consulting Editors. This editorial body announced that the new periodical was to contain the following types of material:

"(1) Original articles on the theoretical foundations of General Semantics and Non-aristotelian systems, as well as on the theoretical or experimental application of the formulations of General Semantics to special fields of scientific, humanistic, and practical endeavor.

"(2) Articles not dealing specifically with General Semantics but which either (*a*) clarify special problems and offer illustrations of the theories of General Semantics, or (*b*) give expression to points of view or aims parallel to the aims of the Society . . . ETC. will, in each issue, reprint from various technical journals selected articles which, because of their relevance to problems of human symbolic and linguistic functioning, merit the attention of an audience beyond the professional circles for which they were originally intended.

"(3) Reviews of books which, for one reason or another, may be of importance to students of General Semantics . . .

"(4) News of activities in Semantics, General Semantics and related fields."

The first issue of *ETC.* which appeared in August of this year, is organized along the lines of this announcement. Beside two book reviews and a department called "News and Miscellany," it contains the following items: "Science and Values" by Edward L. Thorndike, "General Semantics and Modern Art" (illustrated) by Oliver Bloodstein, "Etcetera" (*poem*) by E. E. Cummings, "You Can't Write Writing" by Wendell Johnson, "General Semantics and Psychoanalysis: Korzybski and Freud" by Charles I. Glicksberg, "Chemical Semantics" by S. Weiner, "The Problem of Changing Food Habits: With Suggestions for Psychoanalytic Contributions" by Margaret Mead, and "The Brotherhood of Doctrines" by Alfred Korzybski. The second, fourth and fifth of the eight are printed for the first time. Cummings' poem is reprinted from his *Collected Poems;* and the four remaining items, from four several periodicals.

More than five hundred persons and organizations have already made arrangements to receive the magazine, a rather surprising number for a scholarly journal newly launched. And subscriptions are coming in daily. Scientists, engineers, and professional and business men as well as teachers and linguistic specialists are subscribers, which is good evidence of the broadness of its appeal.

Illinois Institute may share Dr. Hayakawa's pleasure in the auspicious beginning of this new magazine as it did his modest satisfaction in the wide circulation of his book. It is to the credit of an establishment of higher learning such as ours, that members of its faculty should exert a worthwhile influence off its campus as well as on it. And Professor Hayakawa's work has been unquestionably fruitful. For, whatever modifications subsequent research and criticism may effect in the semantic theories which he upholds, his service to the public in arousing interest in vital linguistic issues will remain undisputed.

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(From page 21)

formation concerning the physical properties of rubber compounds.

The law of conservation of energy states that energy cannot be destroyed but can only be converted to a different form. The energy "lost" in hysteresis or damping is lost to the vibrating system as potential or kinetic energy but is transformed into heat in the rubber spring. This may be serious because the life of the rubber depends on its temperature, and the more damping there is, the more heat is generated in the rubber, and the higher the temperature goes. So while some damping in a rubber spring is desirable, too much may mean a short life for the spring. In view of the importance of heat generation and consequent temperature rise in a rubber spring, Mr. Ted Zielinski, formerly of the department of mechanical engineering, studied this problem in a recent master's thesis. Temperatures were measured by means of thermocouples cemented to the rubber specimens. Heat generation is important in tires where it is desirable to use a rubber compound that possesses very little damping capacity, so as to avoid high temperatures. Certain synthetic rubbers, such as the butyl rubber compounds, have so much damping capacity that satisfactory tires could not be made of them. Other synthetics, such as the buna compounds, have less damping but still enough so that they can hardly be used in heavy truck tires where the thickness of the tread prevents loss of heat to the surrounding air.

In general, a material will fail at a lower load if the load is repeated many times than if it is applied only once. This phenomenon is usually described as a fatigue failure, and in the case of rubber, as a dynamic fatigue failure. An interesting question arises as to whether, in a fatigue failure, the material retains its original properties unchanged until failure occurs, or whether there is a gradual deterioration. Mr. T. A. Hunter of the Department of Physics is studying this problem for certain compounds of rubber with particular reference to damping capacity. If the initial damping capacity of a rubber spring is such as to maintain a permissible amplitude of motion under a given vibration condition, a decrease in damping might lead to oscillations of objectionable size.

It is necessary to use the term dynamic fatigue in speaking of repeated loads applied to rubber because the material has static fatigue characteristics also. The strength under a load maintained for a considerable period of time is much less than the strength under a load applied momentarily, in some cases diminishing as much as fifty per cent in a matter of hours.

Few people would think of rubber as a hard material, yet one of the commonly stated properties of a rubber compound is the hardness. One method of measuring it is to use a Shore durometer (type A), an instrument containing a small flat-tipped needle which is pressed into the rubber. The needle is spring-supported and protrudes through a hole in a steel plate. In operation the end of the needle is placed in contact with the specimen of rubber and the instrument is pressed down until the plate is in contact with the surface of the rubber. The deflection of the spring supporting the needle causes a

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pointer to move against a dial, thus giving a numerical figure for hardness. The scale of this durometer runs from 0 to 100. A 30 durometer stock is a soft stock, a specimen of which can be squeezed to two-thirds of its original length by the fingers. An 80 durometer stock is rather hard and a better subject for a testing machine. For many uses, the durometer reading has little significance in itself, since hardness is often secondary. Its real importance is due to the fact that the durometer reading correlates roughly with the modulus of elasticity, a vital property in rubber springs. In large scale production of rubber parts, the durometer furnishes a quick, convenient, and non-destructive check on this important property. Although this test for hardness is similar to those used for metals in that it is an indentation test, it causes only elastic deformation while the hardness tests for metals usually result in a plastic deformation.

Where rubber is used as a spring mounting for an engine, it is often bonded to steel plates at the ends. This leads to an interesting problem in stress analysis. The steel has a modulus of elasticity of about 30,000,000 lb. per square inch in compression. The rubber may have a modulus as low as 200. The steel is so much stiffer, therefore, that its deformation is very small and, because of the bond to the rubber, it restrains the latter, as may be seen in Fig. 4, which shows a rubber cylinder bonded to steel plates at the ends and compressed to about three-quarters of its original length. The result of the restraint is a very high stress in the bond between the rubber and the metal. A mathematical solution for the stress in such a cylinder was worked out by Filon about 1900, using the theory of elasticity, and it is interesting to note that the problem arose then in the testing of concrete cylinders in compression. However, the application of Filon's solution to compounds of rubber is questionable, because he assumed, as is customary in considering elasticity, that stress is proportional to strain and that deformations are small. Neither of these conditions is fulfilled in the use of rubber under load.

## AUTOMOBILE

(From page 23)

BATTERY RECHARGE

The large amount of energy used in cranking the engine for starting is automatically replaced by a generator and proper controls. The dash ammeter will show a high charging rate directly after starting and this value should progressively go down in from two to ten miles of driving if the more recent type of voltage and current controls are on the car. Maintaining a high charging rate for long periods indicates trouble requiring service station inspection.

If no charge at all occurs, the brushes on the generator may have cold oil on them which will thin out and permit commutator contact after a short run. If the no-charging condition continues, prompt attention is required to avoid a run-down and, possibly, a frozen battery. The dash ammeter and its performance becomes an interesting and valuable index to operating conditions.

If the above discussion suggests to the reader some of the many items contributing to the conservation of this important transportation means, then its purpose has been fulfilled.

## SCHOOLMASTER

(From page 24)

here, the students who were the leaders in promoting it investigated the operation of such systems at other schools. They were not discouraged by unfavorable reports. They were not depressed by the narrow margin of supporting votes in our student referendum. There can be no doubt of the excellence of their motives. Some of us who were entirely in sympathy with their programs were not especially optimistic about its success.

It is still too early to arrive at a definite verdict, but we may say that the system is still officially recognized, and that apparently it is to be given a trial of sufficient length to constitute a real test. The difficulties are obvious. Undergraduate college students are men, but they are very young men. To a great extent they continue to feel bound by their schoolboy code of ethics, and one of their commandments is "Thou shalt not snitch." In recognition of this fact, the formal pledge which is written and signed at the end of each examination paper makes no reference to reporting unfair practices which the student has seen, but states only that he himself has neither given nor received help. Even so, it must be assumed that the student members of the Honor Board must have some responsibility for initiating action when they, as individuals, learn of infractions of the system. Presumably, only members of the


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Board have knowledge of the number of cases that have been judged, and information about the sources and the routine of the charges. Undoubtedly, in some cases reports might come from an instructor who has noticed internal evidence of cheating as he reads examination papers. It is interesting to speculate whether many reports have been received by another authorized route — from students who send written information to the Board. Such reports are of course signed, and all details are confidential among the students directly concerned and the Board members.

Our curricula are rigorous. Many of our students have difficulty in meeting the demands on their time for scholastic and other duties. The temptation to cheat in an important examination is sometimes very great. If there is no deep-seated conviction that such cheating is wrong, if there is a feeling that the attainment of a passing grade is the reward for winning a sort of game with the instructor, a student will be restrained from using forbidden methods only if there is an efficient corps of proctors.

From the standpoint of an instructor, a real honor system would be one without a written code, without any provisions for reporting infractions, without any body of judges. Emphasis would be on honor, rather than on a system of enforcing or encouraging honorable methods. How can honor be enforced? What induces each one of us to conduct his affairs decently and fairly? Most of us will not admit that fear of punishment or of disapproval is what determines our behavior. Each of us has his code, but it is not printed and framed. The physician subscribes to the traditional oath of Hippocrates, but, if he is of the high character that we look for in our medical advisers, he does not need to remind himself of the formal pledge that he has taken.

We shall have a real *honor* system when we no longer need an honor *system*. As an approach to something more like the ideal, it is worth while to work with the means at hand, to discuss and to implement the program that is now in effect, and to hope for better things to come. Perhaps this implies too much faith in the perfectibility of our weak human nature. Probably our more sophisticated readers will consider these ideas amusingly naïve. But to the schoolmaster, with many years of contact with young men, they seem to make sense. This world would be even sadder than it is now if we could not look for better things in our overall picture, and even in such less conspicuous affairs as college examinations.




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A great deal of hokum has been written about "personal interest" by advertisers trying to give the impression that every one of their employees regards every customer as his dearest friend. We say only this:

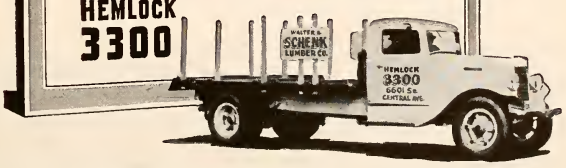
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## MOUSE TRAPS

(From page 26)

error is not measurable by ordinary consistency measurement methods.

The reliability of the automatic consistency control may be shown by an extreme test which has been made several times. In this test the control was set to a selected point on its scale and the consistency measured by standard methods. Fresh water was then allowed to flow constantly into the felting chamber for sixteen hours. An overflow device maintained constant level in the tank. At the end of sixteen hours, the consistency was again measured. The final consistency was found to be identical with original consistency. Thus the automatic consistency control had retained the correct consistency in the felting tank for sixteen hours without the attention of the operator.

## SUN SALUTES

(From page 26)

helped the Army and Navy work out these plans.

Last week he was elected president of the American Association of Urban Universities. A few days before, he had been elected vice-president in charge of colleges and schools for the National Safety Council.

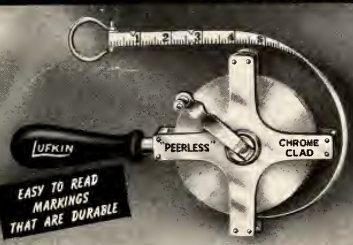
Although only thirty-eight, Heald has been president of Illinois Tech ever since it was founded in July, 1940. Prior to that time he was president of Armour Institute from 1938 to 1940. With his wife, Muriel, he lives at 5844 Stony Island avenue.

## GAS TECHNOLOGY

(From page 28)

The courses of instruction which are offered by the Gas Institute are planned to offer a broad training in those fundamental fields of science which are of greatest potential importance to the gas industry. Chemistry, both organic and physical, plays an important part in the curriculum. Dr. Herbert Bernstein of Illinois Tech's chemistry department is currently teaching the first year graduate course in advanced organic chemistry, while Dr. Bruce Longtin of the same department is instructing in advanced

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physical chemistry. Dr. Vasili Komarewski expounds to the second year men the theory and application of catalysis. Advanced physics is offered by Dr. J. S. Thompson, mathematics by Dr. John De Cicco, and heat transfer by Dr. Max Jakob, all of I. I. T.

Teaching is also a responsibility of certain members of the Gas Institute staff. Dr. Charles H. Riesz, who holds three Armour degrees, teaches gas analysis and supervises the student laboratories. Mr. Benjamin Miller teaches those phases of gas technology which are concerned with pipe lines and gas transportation, while the writer will teach fluid metering, fuels and combustion, and similar subjects. It is expected that staff members will be added in the near future to handle gas manufacturing and utilization.

The instructional program of the Gas Institute began two years ago, when four fellows were enrolled. The student body expanded to seven in 1942, and was increased to twenty at the beginning of the current year. The Fellows now in residence are listed below, with their colleges.

Willard M. Dow, Colorado School of Mines.

Rex T. Ellington, University of Colorado.

Arthur J. Fry, Montana State College.

Roger V. LeClerc, State College of Washington.

Robert S. Levine, Iowa State College.

Milton Lewis, University of Washington.

Eugene H. Luntey, University of Idaho.

Lewis H. Mahony, Jr., University of Denver.

W. Randolph Mason, University of Rochester.

Richard F. Messing, University of Minnesota.

Robert M. Newhall, Tufts College.

Thomas L. Pelican, Colorado College.

Edward A. Pirsh, University of Minnesota.

Henry E. Robison, Washington University.

Leonard E. Savory, University of Denver.

J. W. Selph, Jr., Vanderbilt University.

George E. Smalley, University of Idaho.

Erwin R. Strong, Jr., Texas A. & M.

Allen N. Webb, Kansas State College.

John M. Woods, University of Kansas.

The Gas Institute's first advanced degree was awarded on October seventeenth to Robert M. Newhall, one of the original four fellows, who received the degree of Master of Science. Mr. Newhall and Mr. Henry Robison B. S. and M. S., Washington University, are now candidates for the Ph. D., while Messrs. Dow, Pelican, Savory, Selph, and Strong are working towards the M. S. degree.

The immediate future of the educational portion of the Gas Institute's work is obviously dependent upon the demands of Selective Service, but it is expected that at least six new Fellows will enter in February. Future classes will probably consist of fifteen to twenty carefully selected graduates in chemistry or chemical engineering, and it is expected that the Gas Institute's student body will reach a maximum size of some sixty fellows. Small classes, seminar methods of instruction, and careful supervision should go far towards reaching one of the goals which have been set for the Gas Institute—the training of future leaders for one of the nation's most important industries.

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## FACULTY

(From page 31)

department of the *Seattle Post-Intelligence;* he was editor (with others) of *The College Survey of English Literature.* Dr. Wagenknecht is the author of *Values in Literature; Geraldine Farrar, An Authorized Record of Her Career; A Guide to Bernard Shaw; The Man Charles Dickens; Jenny Lind; Mark Twain, The Man and His Work;* and of pamphlets, articles, and reviews. He is a member of Phi Beta Kappa, the Fellowship of Reconciliation, and the American Association of University Professors.

EVERETT F. WAGNER, Instructor in Physics, received his B.S. degree at Illinois Institute of Technology in 1939, and is now doing graduate work at the Institute. He has been employed in plant engineering work by the Procter and Gamble Manufacturing Company, and has been an instructor in radar on our Lewis campus. Mr. Wagner is a member of Phi Lambda Upsilon and Alpha Chi Sigma.

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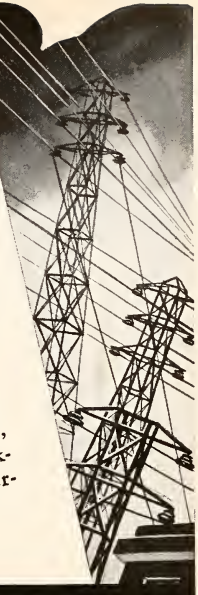


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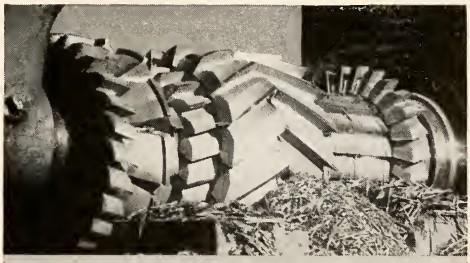
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# THE BOOK SHELF

*Metallography of Aluminum Alloys,* by Dr. Lucio F. Mondolfo. John Wiley and Sons, 1943. $4.50.

This book, just off the press, was written by Dr. Mondolfo while he was employed in several large American aluminum fabricating plants, and while working in the Illinois Tech laboratories. He has recently completed a series of lectures in the post-graduate school on the metallurgy of aluminum.

Dr. Mondolfo is a native of Italy and received his degree, Doctor of Engineering, from the University of Milan. He was employed in the famous plants of the aluminum industry of his country, but becoming *persona non grata* to the political parties in control he had to escape from Italy. He finally came to the United States with the intention of becoming a citizen. He received his first papers, but the final papers were delayed when war broke out. However, he has long been granted the classification of a "friendly alien" and allowed to work in American industrial plants in trusted capacities. At present he is employed in some highly significant and important research work, which will be followed by the erection of a plant.

The book is highly technical, and is meant for use as a reference book for plant operators, trained practicing metallurgists, and other experts in the field of the metallurgy of the light alloys. It is not a text-book to be put in the hands of students. A valuable reference book for technical libraries, it brings up to date available knowledge found in other texts.

Specifically the book covers the binary, ternary and quaternary alloy systems of all known aluminum alloys. Dr. Mondolfo has made an exhaustive search of all obtainable literature in many languages. Included in the book are over 400 photomicrographs original with Dr. Mondolfo. Careful interpretations of the structures shown in these pictures are made. He calls attention to the fact that many diagrams of published systems have not been completed, and that some of those published by previous writers are not mutually concordant. In some cases they are indeed contradictory. He has been able to show that the discordance is often more apparent than real, or only of minor significance, correcting them from his own experience. On occasion he has published the two discordant diagrams because of the authority and importance of the authors and their work. He then gives a discussion of the probable difficulties involved in correctly interpreting them.

Dr. Mondolfo also covers the effect of fabrication on the microstructure of aluminum and the effect of working, heat-treatment and so on. The book is a valuable addition to the literature of aluminum alloys and will find a wide acceptance.

ARTHUR HOWE CARPENTER.

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*Radiographic Inspection of Metals,* by Dr. Otto Zmeskal. Harper Brothers, 1943. $2.75.

This little manual, small enough to slip into one's pocket, is singularly complete in its scope as an introductory text for the application of X-Ray to the industrial inspection of metals. The demand for such a manual became insistent with the outbreak of the war. Dr. Zmeskal is a graduate of Illinois Institute of Technology and studied at the Massachusetts Institute of Technology, where he obtained his Doctor of Science degree in metallurgy. His major work there was in the field of the application of X-Rays to metallurgy, and he is a master of this subject. He became assistant professor of metallurgy at the Illinois Institute of Technology and was given the task of preparing the manual by Harper Brothers which was looking for a text on this subject.

The book is attractive. It is finely illustrated with many good photographs of apparatus, reproductions of X-Ray picture, and numerous ingenious diagrams and graphs to explain the subject matter of the text. Dr. Zmeskal makes no attempt to explain the physical theory as the book is intended primarily for the practical operator in plants who may not be equipped with the necessary mathematical knowledge to understand the theory. Such discussion may be found in the larger manuals by Clark, Compton, and many others. References are given for anyone who wishes to pursue this aspect of the subject.

The text is based on the lectures given by Dr. Zmeskal while teaching his classes of operating personnel taking the Engineering, Science, and Management War Training courses. The book consists of six chapters of text, a chapter of glossary of terms, and four appendices. The chapter headings give a clear idea of the scope of the book. The first chapter, "Introduction," covers the historical background, discovery of X-Rays, etc. The second chapter discusses the sources of radiation and its production, and also the application of gamma rays from radium to the inspection of metals. The third chapter gives a description of the necessary apparatus for industrial inspection of metals, both in the plant and in the laboratory, and of the arrangement of the dark-room and such auxiliary equipment as viewing-screens and the like. The fourth and fifth chapters on "Fundamentals of Radiographic Practice," Parts I and II are the most essential in the book. After faithful study, the student will be able to produce, with a minimum amount of instruction, correct and acceptable X-Ray negatives and interpret what is disclosed. The sixth chapter is devoted to "Applications." A wide selection from field work is given, covering investigation of welds, castings, forgings, and other products. "General Production Radiograph" and microradiography are discussed and appropriately illustrated. The seventh chapter is a glossary of terms and convention diagrams, and this is followed by a well chosen bibliography.

The appendices cover such matters as critical absorption of wave-lengths, voltages required to excite characteristic radiations, and types of penetrometers used in satisfying the requirements of the Army Ordnance, Bureau of Ships, and Air Force. Finally there is a good index. The book should fill a void now existing in literature for elementary instruction in the application of radiography to the inspection of metals.

ARTHUR HOWE CARPENTER.

---

## HELP

(From page 34)

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# ANNOUNCING

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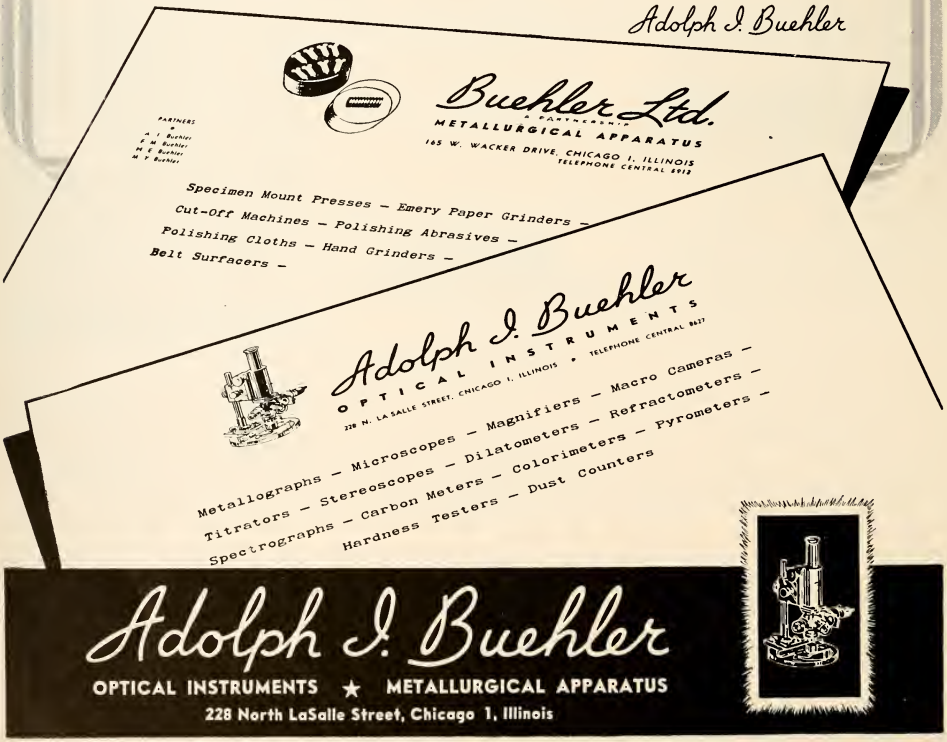
This change is made in order to enable us to maintain a close personal contact with our customers and at the same time provide expanded facilities for handling the rapidly increasing demand for metallurgical testing equipment.

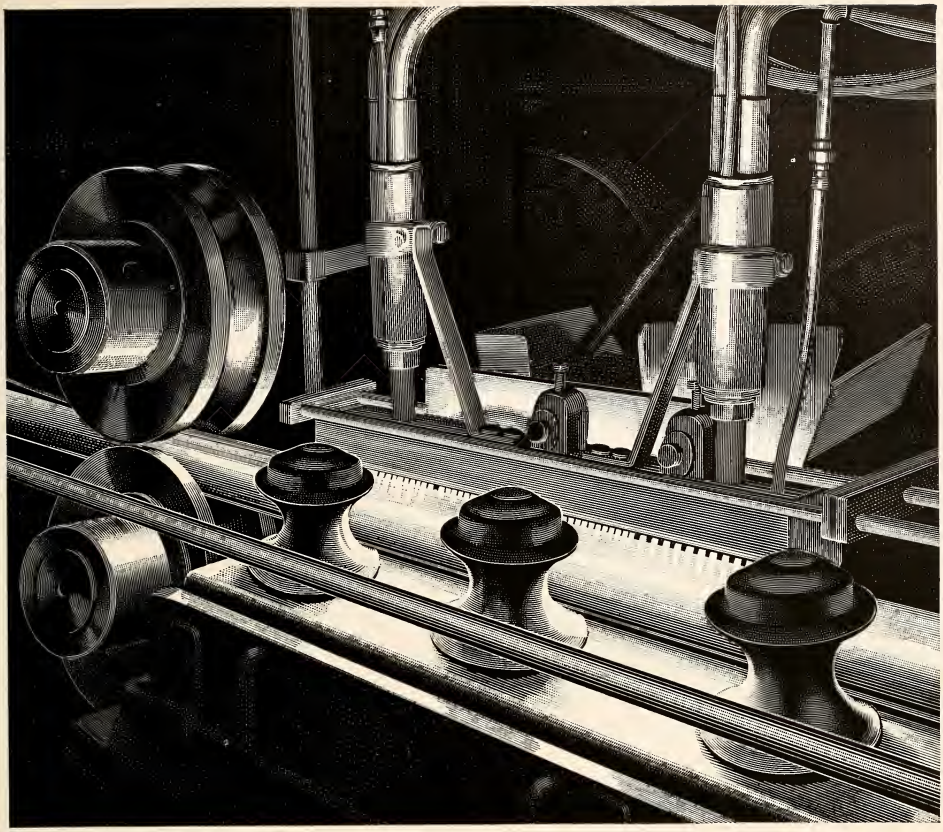
A new organization, Buehler, Ltd., a partnership under my personal direction, will hereafter handle all metallurgical apparatus and sample preparation equipment.

The optical equipment will continue to be handled by the Adolph I. Buehler organization supervised by Mr. George Graves who has long been associated with my staff and who will devote all his efforts to serve you in this field.

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To the hard pressed Allied Nations—struggling to offset the tremendous output of a German war production long since tooled with carbide *by official decree*—went tons of American carbides in steadily increasing quantities. Foresight and preparedness enabled American carbide manufacturers to fill this urgent need and at the same time meet the pyramiding demands of domestic industries.

Today, you will find carbides a factor of vital importance in stepping up and keeping up the production of not only the United States but also such countries as England, Russia, Australia, Canada, China, India, Mexico and many others among the United Nations.

The full extent to which carbides are being used in the cause of victory is difficult to visualize. Carboloy Company production alone, for example, is at an annual rate 45 times greater than that of any pre-war year. Monthly production of carbides—formerly measured in pounds—can today be expressed in tons—many tons per month! Yet the average carbide tool contains but a fraction of an ounce of carbide at the cutting edge—and a single tool during its usable life machines hundreds of parts for the implements of war. Particularly important is the use of carbides for cutting steel—a major field of use for Carboloy tools. (More than 60% of the Carboloy Cemented Carbide produced today for machining purposes is for cutting steel.)

A high order of performance—so high as to have been once considered incredible—is now commonly expected, and obtained, with carbides. Such things as increases in output of 3 to 1, lengthened tool life of 10 to 1, finish cuts that eliminate arduous grinding, machining of former "non-machineable" alloys, reductions of 25%, 50%, 75% in machining costs—results such as these are every-day occurrences in war production today.

This widespread use of carbides in war, indicates a new era of production economy when normal commerce returns. Manufacturers who have converted to carbides to meet the present emergency will then have at their immediate disposal an economic weapon of unusual advantage in seeking world markets.

**Carboloy Company, Inc., Detroit, Mich.**

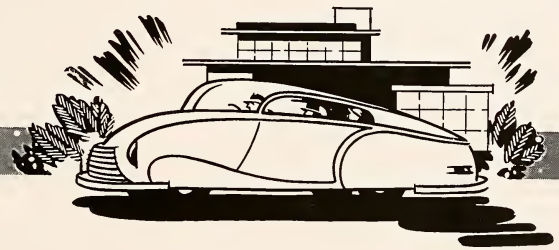
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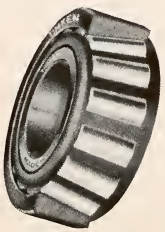
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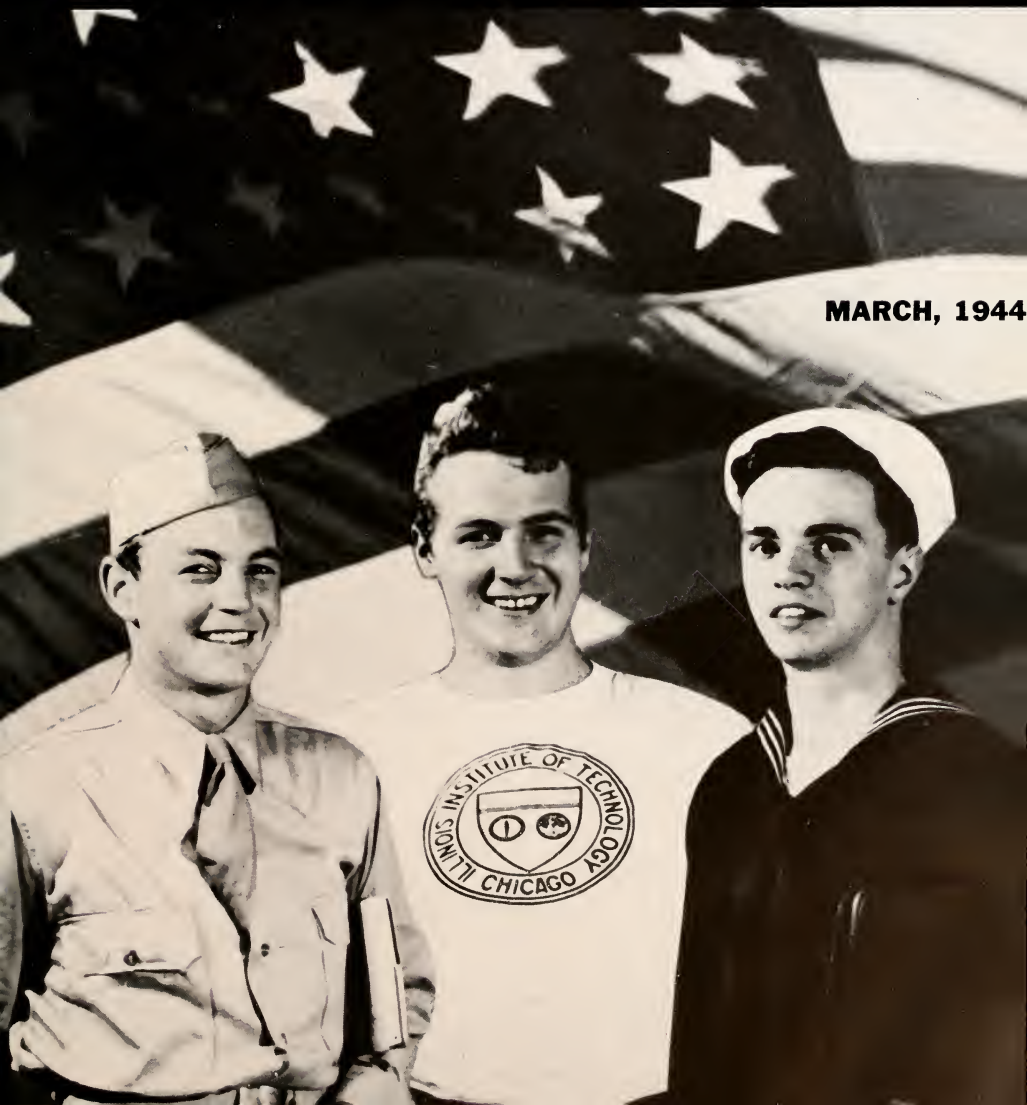

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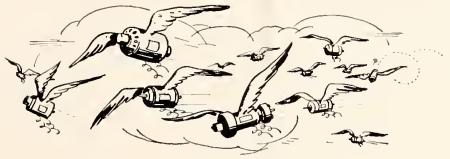
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# Campus News

RESEARCH AND ENGINEERING KEEP GENERAL ELECTRIC YEARS AHEAD

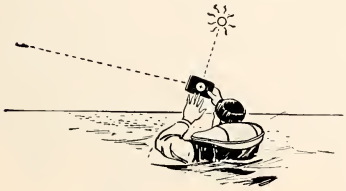


## FLYING FAMILY

WHEN a big bomber or a punchy fighter thunders off the field to keep a date high over an enemy target several hundred miles away, many electric motors go along with it—but not just for the ride.

From the time the starting motors turn over the cold engines till, back over the home field, a combat-weary man presses a button and the retractable landing gear lowers from the plane's belly, electric motors are doing hard, exacting work.

These motors, seemingly delivering power out of proportion to their lightness, have taken over most of the tiring muscular jobs . . . like lifting and lowering the flaps against tremendous and varying wind pressures . . . like swinging around the gun turrets at the gunner's slightest signal. And thousands of these are G-E motors, being supplied in ever-increasing numbers for armament operation and for the actuating parts of planes.



## SOLAR SEARCHLIGHT

WHEN a dazzling point of light gleams on the broad seascape, and when suddenly that point becomes a blinding glare that persists in following your plane, chances are a man is adrift at sea and needs your help.

He is using one of the new emergency signaling mirrors, designed by General Electric in co-operation with the Coast Guard, the Bureau of Standards, and the National Inventors' Council.

These mirrors are already aboard hundreds of lifeboats and rafts. The shipwrecked sailor follows three simple steps, printed in large letters on the back of the mirror, to shoot a beam of sun-glare at a target—and that target may be a plane or ship up to ten miles away.



## UPSTART

MAYBE you've wondered how the big Fortresses and Liberator bombers of our Air Forces—operating from the cold Aleutians, Newfoundland, and Iceland—can be started in such cold climates without a moment's loss of time.

One of the reasons is a small General Electric device—the starting vibrator for aircraft engines—one of the three hundred and more G-E developments for our fighting planes. This starting vibrator provides a very hot spark which helps aircraft engines to start instantly, regardless of weather conditions.

*Hear the General Electric radio programs: "The G-E All-girl Orchestra" Sunday 10 p.m. EWT, NBC—"The World Today" news, every weekday 6:45 p.m. EWT, CBS.*

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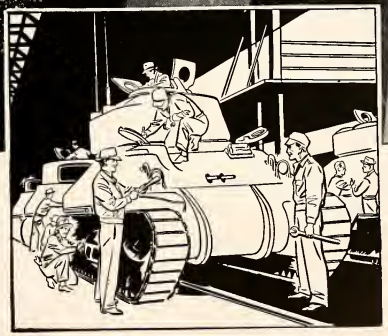
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Contributing in no small way to supplying this record demand is Peabody S-P coal. Pouring from six ultra-modern refineries in a steady stream, this famous coal with its stepped-up efficiency is eminently fitted for the vital war time job of helping to keep the nation adequately powered — and warm.

"SP" SUPERIOR PROCESSED COAL

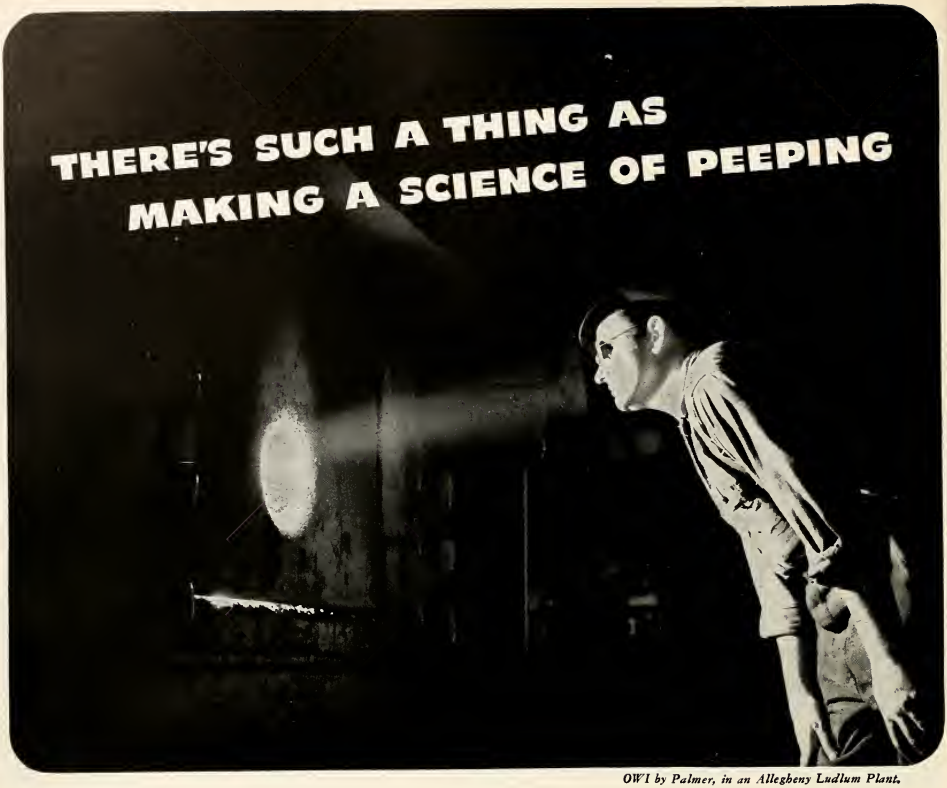
Shaft mined from 5th and 6th veins, So. Illinois and 6th vein, Central Ill. district. Ash reduced at least a third by precision refining.

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# THERE'S SUCH A THING AS MAKING A SCIENCE OF PEEPING



*OWI by Palmer, in an Allegheny Ludlum Plant.*

WITH this melter, studying the action of some 35 tons of alloy steel in an Allegheny Ludlum electric furnace, peeping is resolved into a science.

His job is one of the earliest in a long series of operations which bring a melt of Allegheny Ludlum stainless, electrical or other alloy steel to its final form, rigidly true to specifications. His experience determines whether the molten mass within the furnace is progressing at the proper rate, and dictates any adjustments necessary to produce the quality of steel specified. His judgment is double checked, of course, by thousands of dollars worth of amazingly accurate testing equipment, built for analyzing with hairline precision.

For, in wartime especially, the properties of alloy steels must be maintained with the utmost consistency. Lives of men—even the outcome of battles depends upon this uniformity, because the place of alloy steels is always in the vital heart of a war mechanism.

Lives and battles depend upon other things in this war, too—matters that come home to every household. Buying bonds, conserving food, fuel, gasoline, rubber, waste fats and scrap metal—all these have to do with how soon the war will be won, and at what price. They are *everyone's* jobs. Have you done —are you doing—*all* you can?




**Allegheny Ludlum**
**STEEL CORPORATION**
BRACKENRIDGE, PENNSYLVANIA

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# *As one student to another*

Because we know so well what changes have taken place on your campus and how they must be affecting your view of things, we would like to remind you of something.

Alcoa Aluminum probably means to you now just a whale of a lot of aluminum that is going into war tools.

But Alcoa, the company, is people.

And we have a long-time goal—a very human, peacetime goal we are saving in the hope of sharing with you. We would like you to think of us as Imagineers in aluminum, creators of employment and higher standards of living.

Alcoa is, first of all, a great collection of engineering knowledge based on experience that goes back to the birth of aluminum as a commercially available metal.

Then, it is imagination. It is the vision that sees aluminum, not as just another metal to sell but as a means of eliminating dead weight, or corrosion; as a means of reducing maintenance costs or increasing output.

The full significance of Alcoa can be summed up as experience in the application of aluminum to make more things available to more people. It's what we consider the only means of solving the perennial employment problem.

It requires constant inquiry. Constant study. Constant co-operation with every field of human effort that uses metal.

The results are as practical a way of bringing about a better world as any yet devised.

We hope, when we both return to the job of rebuilding the world, some of you will choose to do it with aluminum. That will mean, of course, with *Alcoa.*

*A PARENTHETICAL ASIDE: FROM THE AUTOBIOGRAPHY OF*

ALCOA ALUMINUM

REG. T. M.

• This message is printed by Aluminum Company of America to help people to understand *what we do* and *what sort of men* make aluminum grow in usefulness.

# "INDUSTRIAL PROSPECTING"—

A competent observer has recently noted that if the present consumption of petroleum products continues on the same prodigious scale, the United States may soon become an oil importing nation—a situation unthinkable a decade ago. An end to the great Mesabi iron mines is also in sight according to some geologists. The obvious solution for these possible depletions is a concentrated campaign of prospecting.

When natural resources are in danger of depletion the recourse to research or prospecting is easily understood, but when a manufacturer's product lags in consumption the solution to the problem is not always obvious. Perhaps the sales department is to blame, or perhaps management for not operating more efficiently. Of course, the fault may lie with one of these groups, but it is more likely that it finds its cause outside the factory or office. The very lack of an obvious solution is one of the most important reasons for a continuous program of industrial research.

It is trite, but none the less important, to point out that the knowledge of any subject is never static, for what is a fact today is often only a half-truth tomorrow. So it is with some products, that is, a completely satisfactory commodity under one set of conditions often becomes obsolete in view of developments in allied fields. The alert industrialist is aware of this and makes provision for keeping abreast of if not ahead of the times, insofar as his products are concerned. In other words he is continually prospecting for new ideas and new methods.

When the prospector set forth with his burro and grubstake in the old days he didn't look very prepossessing, but underneath his picturesque exterior he packed a good deal of practical, rule-of-thumb, and even scientific information about mineralogy with which he made one big strike after another.

The modern scientist may lack the picturesqueness of the old-time prospector but he, too, possesses a good deal of practical information. He differs from the old prospector, however, in that he has not a little, but a great wealth of scientific information in his own head, in the heads of his colleagues and stored away in vast scientific libraries. And this scientist, when he turns to industrial research, can also make one big "strike" after another.

The Armour Research Foundation is made up, after all, of a group of "prospectors," all of them seeking the solutions to a variety of problems. They have their "burros, picks and shovels" in the form of research instruments and equipment, and their search for new, improved, or modified products increases industry's grubstake in their effort. If production costs are too high they will suggest new production methods. And if raw materials are growing scarce these industrial prospectors will devise techniques of conservation or even develop new materials.

—*From* THE FRONTIER, *September, 1943*

**ARMOUR RESEARCH FOUNDATION**

*Founded to render a research and engineering service to industry*

CHICAGO, ILLINOIS



# THE TEAM THAT BUILT A THOUSAND SHIPS

IN the short space of time since Pearl Harbor, more than a thousand 10,000-ton Liberty ships have been built in America's shipyards.

Two things are chiefly responsible for this epic production achievement: the resourcefulness of our shipbuilders and new mass production methods made possible by the oxyacetylene flame and the electric arc.

By widespread use of revolutionary pre-fabrication techniques, America's shipbuilders have created a gigantic fleet of cargo ships which are now helping to turn the tide of war in our favor.

In many other vital fields of industry the oxyacetylene flame and the electric arc have played equally important roles. And their proven efficiency and economy in war production foreshadows the important place they will assume in peacetime manufacturing.

Air Reduction research and engineering has made many important contributions to the development of oxyacetylene and electric arc processes. If you would like to receive our informative publication "Airco in the News," we shall be glad to send you a free copy. Address your request to Mr. G. Von Alstyne, Dept. C. P., Air Reduction, 60 East 42nd Street, New York 17, N. Y.




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# ELIAS HOWE — 1819-1867

## Inventor of the Sewing Machine



Drawing by Charles E. Dewitz

Elias Howe was born in Spencer, near Worcester, Massachusetts in 1819. His father a farmer, carried on besides farming a simple handicraft in which the children could take part. Elias, an observant boy, saw what machinery could do to lighten labor and multiply results. He acquired an unrelaxing grip on ideas to be worked out and was deaf to all discouragement. The talk of a sewing machine had now taken hold of the people and the time was ready with the growing need for labor-saving. The young Howe brooded over it and said, "I may be the man to invent that machine and make a fortune."

During the winter of 1844-45 he labored steadily at his machine. By April his invention was complete. But the tailors and seamstresses objected on the ground that they would be reduced to begging. This same objection had discouraged the inventors of 1790, 1830 and 1834 but not Elias Howe. He was unshaken in his faith.

There followed much contention as to patent rights but Howe finally came to his reward. The hardship of the long struggle affected his health and he died in 1867.

Crowe Name Plate & Manufacturing Company, Chicago

## Contributors

**Linton E. Grinter** is vice-president of Illinois Institute of Technology, dean of the graduate school, and professor of civil engineering.

**J. H. Hazlehurst** is engaged in general management consulting work as president of Public Utilities Service. He is a member of the American Psychology Association, the American Association of Applied Psychology, the Psychometric Society, and the Midwest Psychology Association. He holds the degrees of B.S. in Electrical Engineering from Illinois; M.B.A. in Corporation Finance and Banking from Northwestern; and Ph.D. in Industrial Psychology from Northwestern.

**Thomas James Higgins** is associate professor of electrical engineering at Illinois Institute of Technology.

**Norman C. Penfold,** an Armour graduate in the class of 1933, is supervisor of engine research at the Armour Research Foundation.

**John J. Schommer** is director of athletics, director of placement and professor of industrial chemistry. He is a special advisor to the selective service system.

**Albert J. Steiner,** a graduate of Armour in the class of 1921, received his F.P.E. degree in 1936. He has been on the staff of Underwriter's Laboratories, Inc., since 1921, and is now head of the protection department. He is a member of the National Fire Protection Association and the American Wood Preservers Association, and a committee member of the American Society for Testing Materials.

**John I. Yellott** is director of the Institute of Gas Technology, and chairman of the war training committee of the Illinois Institute of Technology.

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**Cover Picture:** Composition and photography by Bruce V. Kunde, '44. The soldier is R. B. Martin; the civilian engineer, Jack Sluis; the sailor, Norman Saskey.


# ILLINOIS TECH ENGINEER
AND ALUMNUS

MARCH 1944

VOLUME 9 NUMBER 3


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Alumni Section

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STUDENT STAFF

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# EVOLUTION OF THE 3-PHASE 60-CYCLE A. C. SYSTEM

By

THOMAS JAMES HIGGINS

*The essential feature of scientific history is the recognition of growth, the interdependence of successive stages of discovery.*

Karl Pearson

Supplying electricity as a public service is a comparatively young industry: scarcely three-quarters of a century have passed since it was initiated. Yet in this brief span it has evolved so rapidly that but few of the original features are now discernible. Such is especially true of the networks used for transferring electrical energy from points of generation to points of use. Thus, today networks of the first stage of the art exist only as labeled fragments. But cherished fragments, to view which can hardly fail to engender in the intelligent engineer, interested in the history of his profession, the desire to learn at least the broad outline of one of the more fascinating stories in the annals of electrical engineering: of the change in character of these networks—from the simple two-wire direct-current circuits of the late '70's to the complex interconnected alternating-current systems of the present.

## I. Rise and Fall of Direct-Current

No doubt it will surprise many—especially those educated in this generation—to read that Edison was not the first to erect and operate central stations; that his famed three-wire direct-current system of transmission followed, not preceded, successful alternating-current systems; and that

An A. C. calculating board for studying operation of power systems.

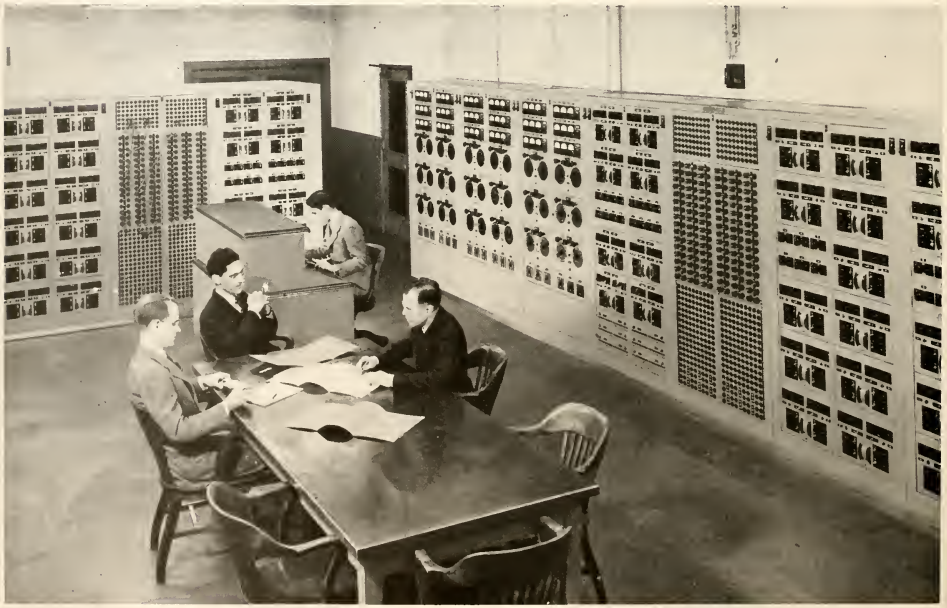
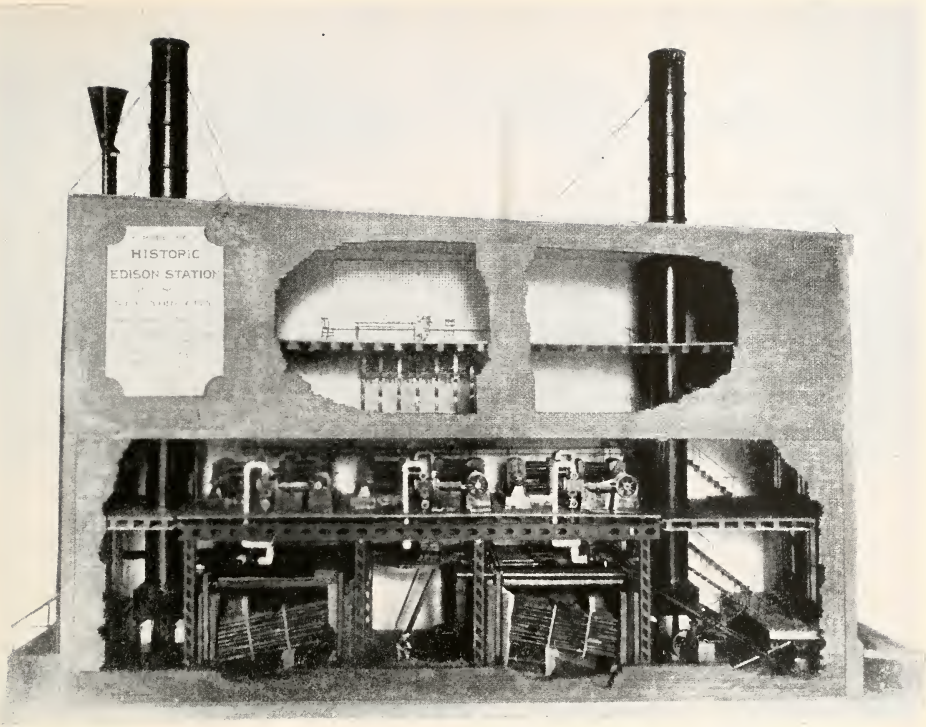


*Photo: Permission Westinghouse*

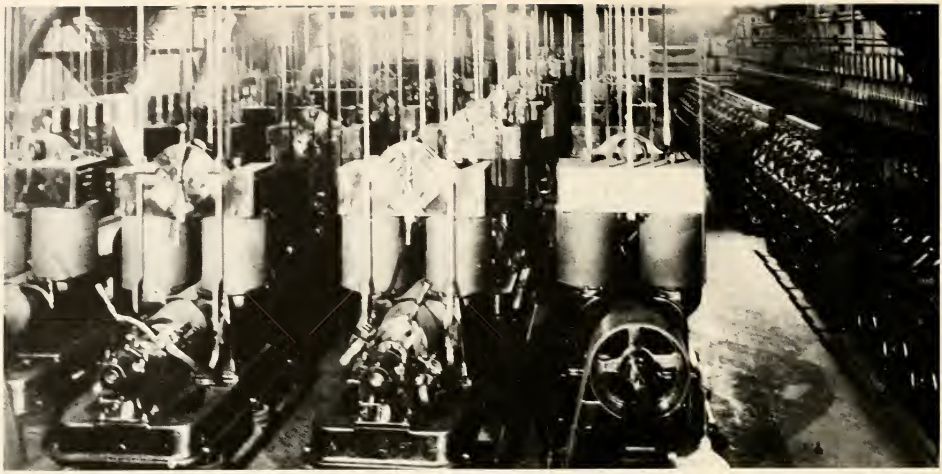



Layout of Edison's Pearl Street Station.

his system of illumination by crude incandescent lamps post-dated, by nearly a decade, installation of the first commercially-operated system for electric illumination of public thoroughfares—by arc lights, a method already old at the time Edison opened the Pearl Street station in 1882. For Davy had discovered the electric arc in 1801; and in 1808 had fired public interest in arc lighting—through demonstration of the brilliance of an electric arc struck between carbon rods maintained at the considerable voltage afforded by the (just-completed) great battery of the Royal Institution. But the carbon rods were quickly consumed; and the batteries of that and yet later days were both rapidly discharged and expensive to renew: whence commercial exploitation of arc lighting awaited, perforce, both development of improved types of arc lamps and the advent and gradual perfection of a more efficient and economical high-voltage source — the steam-powered, electrically-excited direct-current generator. Thus (though arc-lamps powered by crude steam-driven, permanent-magnet excited alternating-current generators were installed in a number of lighthouses along the French and British coasts during the '50's and '60's) it was not until the late '70's that public arc lighting became economically feasible.

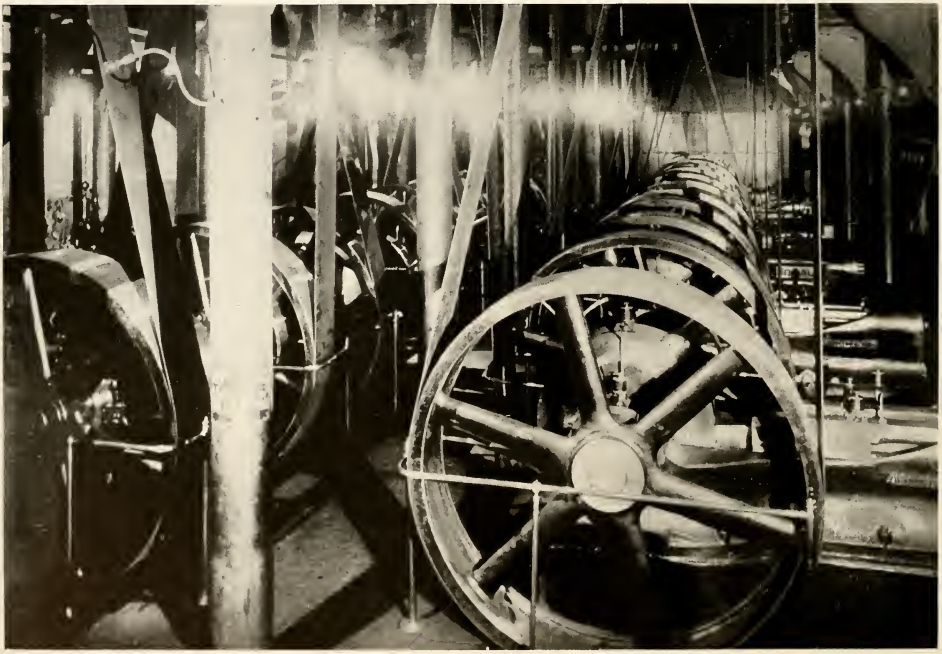
In the early '70's Gramme invented, patented, built, demonstrated, and sold in quantity several types of direct-current generators for electroplating, powering motors, and arc lighting. In 1876, at the Breguet manufactory for Gramme machines, Jablochkoff invented his famous "candle," an improved type of arc lamp. Shortly, the Jablochkoff candle and the Gramme lighting generator were conjoined to furnish the first practical system for large-scale electric lighting of public streets. Soon after, it was found that alternating-current was better suited to the Jablochkoff candle; Gramme alternating-current generators for this purpose appeared in 1878. This was one of the first (perhaps the very first —for Wilde's attempts in the '60's to introduce alternating-current for electric furnaces and arc lighting had failed) successful commercial applications of alternating-current.

While the system just delineated was being developed, Charles F. Brush was developing his constant-current system. Following several years of experiment and an initial successful commercial installation in San Francisco, Brush introduced his direct-current system into New York City, commencing operation in lower Manhattan shortly before Christmas of 1880. Subsequent to these successes Brush systems appeared throughout the United States and in Europe; in the latter it competed with and eventually supplanted the Gramme-Jablochkoff system.



Above: A typical central station of the early nineties.

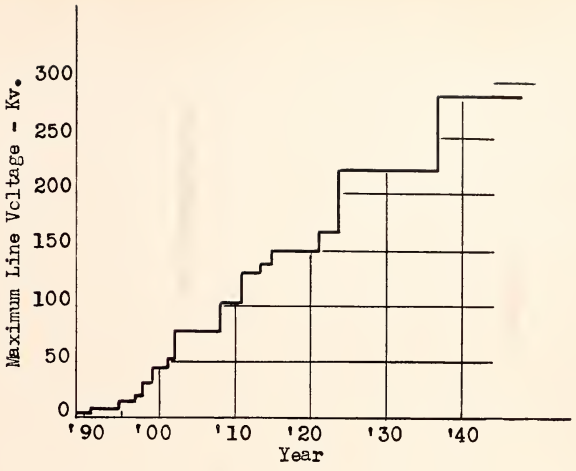
Below: Prime-movers for driving generators shown above.



Coevally with Brush numerous companies in the United States (notably, the Thomson-Houston Company) were developing and installing systems for arc lighting. In consequence, at the time Edison in this country and Swan in England produced the first successful systems for lighting by incandescent lamps, companies operating direct-current arc lighting systems were widespread, well established, and prepared to offer formidable competition to the newcomers.

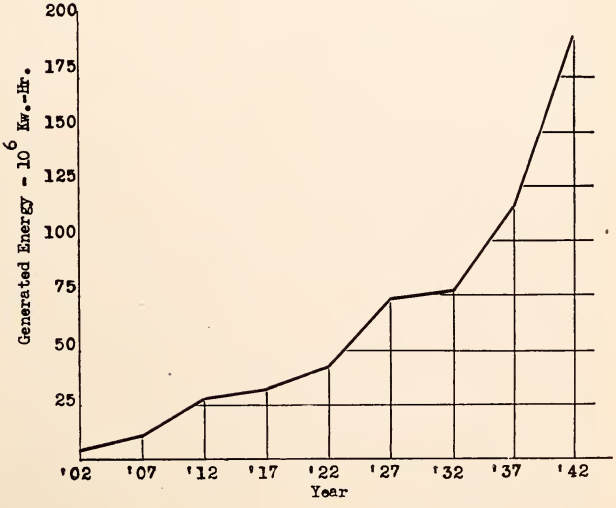
Yet, once introduced, incandescent lighting quickly supplanted arc lighting as a general medium for electric illumination. For though the intensity of the arc lamp was most advantageous for outdoor use, this very brilliance rendered it quite unsuited to interior use. Recognition of this and yet other disadvantages—the danger attending high-voltage circuits; the inconvenience of series operation; the need of frequent, even daily, replacement of the carbons—had spurred many to attempt invention of a satisfactory low-voltage incandescent lamp. This end was achieved, independently and quite simultaneously, by Swan and by Edison. The latter, with characteristic energy and tenacity—*"I made up my mind that the problem of the subdivision of the electric current could be solved and made commercial"*—proceeded immediately to exploit his invention. Within little more than three years after grant of his first lamp patent he had designed, built, installed, and put into operation (on September 4, 1882) a complete public power system, the first in America—but not, as is usually stated, the first *anywhere*. For at least two public (in that power was available to private consumers) systems were already in operation in England: at Godalming, in Surrey (1881); and in London, at Holburn Viaduct whereas Edison and his associates had started operation midway of '82. Neither of these systems, however, were as elaborate as the Manhattan system with its component voltage-regulated network of fourteen miles of armored underground conductor, fused links for overload protection, attached meters, paralleled loads, and other rudiments of a modern underground distribution network.

One grave disadvantage, though, attended operation of this network. Range of service was severely limited in that the cost of conductors needed to convey the current over any considerable distance was quite prohibitive. This restriction was somewhat eased by Edison's—and, independently, John Hopkinson's—invention of the three-wire system. Successful




Above: Growth in transmission voltages.[1]

Below: Growth in electric generation.[2]




1. From *Entering the Seventh Decade of Electric Power*, Charles E. Neil, Edison Electric Institute Bulletin, 10 (1942).

2. From *Official Census of the Electrical Industry*, (1942).

operation of the first installation utilizing this system—at Sunbury, Pa., in July, 1883—resulted in subsequent universal use of Edison distribution systems. But though the three-wire system approximately tripled the area which could economically be served by a central station, this increase was insufficient to meet the mounting demands upon the direct-current systems. Various direct-current schemes to circumvent this areal limitation were proposed and instituted by prominent electrical engineers of the time: Brush, Weston, Thomson and others. These men recognized that the key to the problem was to effect some method of transmitting power at high voltage and low current (thus enabling use of conductors of relatively small cross section) to the load points, whereat it was to be subdivided (to use a term of that day) and distributed at low voltage to the electrical devices utilizing it. But the schemes they evolved were, in an electrical sense, structurally unsound; attained only limited use; and were abandoned when areal and yet other operating difficulties were resolved through introduction of alternating-current systems in the late '80's.

The germ of the alternating-current system of distribution is to be discerned in an 1878 patent issued to J. B. Fuller for use of an alternator and connected induction coil for electrical distribution. Seemingly, however, Fuller proceeded no further with his idea; so that it was not until some years later that actual, practical systems were inaugurated: in England in 1884 by the firm of Messrs. Gaulard (an Italian engineer) and Gibbs (an English promoter); in Hungary in 1885 by Ganz and Company, utilizing equipment designed by Zipernowski, Deri, and Blathy, engineers in their service. The alternating-current system devised by this trio is essentially identical with that used today. (In 1886, for example, Ganz and Company installed an alternating current system in Italy comprising two single-phase alternators, step-up transformers, a seventeen-mile transmission line, step-down transformers, and a distribution network.) Contrariwise, the series scheme used by Gaulard and Gibbs was soon superseded. But though their work was of no permanent value, electrical engineering is indebted to them for the attention they drew to the possibilities of alternating-current service.

As one means of advertising their system they exhibited at the Turin exposition of 1884: a twenty-five-mile transmission line erected between Turin and Lanzo and illuminated at both ends and at intermediate points by power transmitted according to their system. In such fashion George Westinghouse became acquainted with the work of Gaulard and Gibbs and, always on the lookout for new ventures, first optioned (1885), then purchased (1886) the American rights to their system. For experimental purposes the Siemens alternating-current generator and the induction coils comprising this system were imported from England. These were turned over to William Stanley, a brilliant young engineer who had associated himself with Westinghouse early in 1884.

In 1883 Stanley had become interested in the Brush distribution system mentioned above; had recognized the essential defect in it and other proposed systems—the inadequateness of the methods used for voltage regulation of the individual loads; had hit upon the idea of self-regulation through use of alternating-current; had worked on it after joining the Westinghouse organization; and at the time Westinghouse proposed investigating the Gaulard and Gibbs systems had worked out a scheme involving generation and transmission of alternating-current power at high-voltage; reduction of voltage at the load-points through use of paralleled step-down transformers with closed iron core, high-voltage primary coil, and low-voltage secondary coil; and distribution to loads paralleled across the low-voltage coils. Unfortunately, inasmuch as Stanley was unable to convince Westinghouse's advisers of the feasibility of his system, the former was unwilling to finance the experiments necessary for demonstration and perfection.

About the time he had arrived at his solution, Stanley's health had begun to fail; he was advised to leave Pittsburgh for more salubrious surroundings. Stanley "had a little capital, and finally I made a trade with Mr. Westinghouse and sold him half my holdings, realizing several thousand dollars, and agreed to use the funds so obtained in experimental work for the company's benefit." With these funds Stanley went to Great Barrington, Mass.; equipped a laboratory; installed a single-phase distribution system comprising steam power plant, Siemens alternator, 4,000-foot high-voltage line, and a half-dozen paralleled step-down transformers feeding incandescent lamps. In the Barrington laboratory Stanley also tested (1886) the use of transformers in step-up, step-down concatenation, the method now in general use. These Barrington experiments and additional experiments near Pittsburgh proving successful, the Westinghouse Electric Company (which had been formed early in 1886) undertook sale of the system.

In November 1886 the first commercial plant started operation in Buffalo. Successful operation of this plant resulted in numerous orders for alternating-current installations. To fill these orders the Westinghouse Company undertook to design, to develop equipment for, and to install alternating-current systems throughout the country. This procedure brought them into direct conflict with the Edison Electric Light Company, at that time in virtual control of the incandescent lighting business. At heavy cost the Edison Company had installed extended low-voltage direct-current distribution systems in the major cities; it now appeared that these investments were to be jeopardized through forced competition with a new and technically superior system. A bitter struggle ensued.

The supporters of direct-current endeavored by legislative action and by discrediting remarks printed in the press, trade journals, and periodicals of the day to undermine confidence in and to prevent the spread of alternating-current; the Westinghouse Company countered devastatingly by publishing accounts of new and successive installations. By 1890 it was evident that alternating-current could not be headed off; indeed, it was conceded that in many respects it was superior to direct-current. In 1892 the Edison Electric Light Company and most of the other important electrical manufacturers not associated with Westinghouse were merged in the General Electric Company; it and the Westinghouse Company pooled their alternating-current patents; as alternating-current motors and other apparatus were developed, the Edison distributing companies likewise adopted alternating-current; from these alternating-current systems rotating synchronous converters fed those direct-current networks already installed whereof the magnitude of invested capital was too great to permit abandonment; gradually even these were absorbed. Today these networks exist only as annoying remnants in a few large cities; while generated direct-current power for the most part utilized for railway purposes, accounts for less than one per cent of the total generation.

## II. The Rise of Alternating Current

Alternating-current systems of today are preeminently three-phase, 60-cycle systems. But unlike the Goddess Minerva this conjunction did not spring, full-fledged, from the corporate minds that sponsored the

polyphase system. Indeed, the earlier stages of the development of alternating-current system were marked by what have been termed—somewhat romantically — the "battle of the phases" and the "battle of the frequencies"; conflicts waged (i) between the proponents of two-phase and of three-phase systems and (ii) among those who at one time or another advocated 133⅓, 125, 83⅓, 66⅔, 60, 50, 40, 30, and 25 cycles as a standard frequency. Interestingly, each of these conflicts was eventually resolved by development in the art itself, rather than by the corporate strength supporting the winner.

When in 1886 the Westinghouse Company introduced the alternating-current system into America—European systems had been in operation for some years—alternating-current motors comparable in performance to available direct-current motors were not in existence. In consequence, the earliest alternating-current installations were solely for lighting purposes. At the time nothing was known of analytic transformer design; empirical consideration suggested that a comparatively high frequency was best suited to distribution transformer operation. Accordingly, the Westinghouse company adopted 16,000 alternations per minute (as frequency was then measured) as being sufficiently high for satisfactory transformer operation, yet easily afforded by the small single-phase 2,000 R.P.M. 8-pole belted generator they were then furnishing. For somewhat similar reasons their major competitor, the Thomson-Houston Company, standardized on 15,000 alternations per minute. Thus, considerations *re* apparatus determined choice of the first standard frequencies: 133⅓ and 125 cycles.

As systems enlarged, it became essential to market generators of much greater capacity; accordingly, around 1890 the use of slow-speed direct-coupled engine-type generators was introduced from Europe. Such slow speed machines, if operated at the frequencies then in use, would have required a prohibitive number of poles (200 for an 80 R.P.M., 133⅓ cycle generator). The Westinghouse Company, after careful study of the variables involved, selected 60 cycles, a compromise between higher values deemed better suited to transformer operation and lower values actually somewhat better suited to generator design. Between 1890 and 1893 a number of 60-cycle, single-phase systems were installed. As were the 133⅓-cycle, single-phase systems before them, these early 60-cycle installations were devoted primarily to lighting; satisfactory commercial induction motors were not as yet on the market.

For though Tesla had announced his invention of the polyphase induction motor in May, 1888, it required nearly a half-decade of expensive experiment for Westinghouse (which held the Tesla patents) and others to develop motors possessing satisfactory mechanical and electrical characteristics and operable at frequencies which could also be used for commercial circuits supplying lighting loads and the like. Such motors having been developed by the Westinghouse Company in 1892-93, the question of marketing remained: for suitable supply systems were then not in use. According to Benjamin Lamme, Chief Electrical Engineer of the Westinghouse Company for decades, it was decided that if Westinghouse were to market polyphase systems suitable to both lighting and motors (presumably, these systems were to be sold on the basis of immediate use for lighting and the promise of later lucrative returns from motor loads), a demand for induction motors would naturally follow. For various reasons—among the more important of which were that two-phase systems were less expensive than three-phase; that long distance transmission line operation with its lesser cost for the three-phase system was then not an important factor in central station operation concerned primarily with single-phase lighting circuits; and that some of the early forms of generator windings and the original form of the Tesla induction motor were more readily suited to two-phase than to three-phase work—the Westinghouse Company adopted the two-phase system.

On the other hand, the Thomson-Houston Company, faced with the necessity of avoiding infringement of the Tesla patents and already very active in pioneering long distance, high-voltage alternating-current transmission lines, took up the three-phase system. By 1893 the General Electric Company (formed of the Thomson-Houston Company and others) had installed a number of three-phase systems, one of the more impressive of which consisted of a 10,000-volt, 23-mile line from Mill Creek to Riverside, California. This system is often cited as the first commercial three-phase installation in the United States.

In the same year (1893) the Westinghouse Company managed an impressive display at the Chicago Columbian Exposition, an exhibit of induction motors, synchronous motors, and two rotary converters, which conjoined with display of their installation for furnishing electric lighting of the building and grounds to excite considerable admiration. This electrical triumph was a potent factor in the decision of the Cataract Construction Company, the promotion company for the Niagara Falls hydro-electric project, to award to Westinghouse the contract for the generators (and associated electrical equipment) comprising the initial installation at the Falls, these machines to be built according to designs furnished by engineers of the promoting company.

Dr. George Forbes had designed for them a 250 R.P.M. 8-pole (hence 16⅔ cycle) generator comprising a central fixed armature surrounded by a rotating field structure. After examination of this design the Westinghouse engineers suggested a 250 R.P.M. 16-pole (hence 33⅓ cycle) machine, arguing that this frequency was much better suited to rotary converter operation (an important consideration in that among the chief customers were to be several companies requiring large blocks of direct-current power), would afford a greater range of speeds for induction motor operation, and would do away with the quite intolerable winking of incandescent lamps on 16⅔ cycles. As a compromise 250 R.P.M. 12-pole 25-cycle machines were adopted. In consequence of the publicity attending choice of this frequency for the Niagara project and in that it proved to be ideally suited to the slow-speed, engine-type generators then coming into use (as lights did not wink too noticeably, and as it was quite advantageous to early designs of synchronous converters), 25-cycles was shortly adopted as a standard low frequency.

While in the fashion just described 60 and 25 cycles thus came into use as standard frequencies, they were not without competition. The Westinghouse Company, desirous of standardizing on 60 and 30 cycles, in some instances advocated the use of the latter in place of 25 cycles; at one time the General Electric Company endeavored to introduce 40 cycles as a substitute for both 60 and 25 cycles; and both 66⅔ and 50 cycles found sponsors. But except for 50 cycles, still retained to some extent (chiefly in California), these frequencies were eventually dropped.

The battle of frequencies, therefore, finally narrowed down to the two standards of 25 and 60 cycles, two being accepted because it appeared that between them they covered fields of service so widely different that neither could be expected to cover all alone. Thus it appeared that 25 cycles was most suitable for low-speed

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# THE TREATMENT OF WOOD TO REDUCE COMBUSTIBILITY

By

A. J. STEINER

Wood, one of the greatest natural gifts to man, has played an important part in the progress of our civilization. The natural characteristics of wood make it the most adaptable building material. The supply is abundant and is capable of replacement almost at will, but the combustibility of wood has encouraged the use of steel, concrete, and masonry materials as substitutes.

### Historical

Efforts to reduce the combustibility of wood by applying surface coatings and washes date back to Roman times when coatings such as clay, vinegar, and alum solution were applied to wooden storming towers and to war vessels. Since then, many surface treatments have been developed for use on wood aboard ship, in theaters and other places of assembly, and elsewhere.

The question of flame-proofing of wood has been investigated in many European countries. The following examples will illustrate the nature of the experiments conducted to solve the problem:

In 1638, Nikolas Sabattini recommended application of paint made of a mixture of clay and gypsum.

In 1735, Privy-Councillor Polhems, of Sweden, suggested the use of a solution of salts, such as alum and copper sulphate, for sealing the pores of wood to exclude air and to prevent combustion.

In 1823, a Bavarian chemist, Fuchs, applied a mixture of sodium silicate and chalk to fire-proof the wood employed in rebuilding the Munich Theater. At about this time Gay-Lussac suggested the use of borax and of an ammonium salt.

In 1893, the chemist Peter Lochtin published the results of a very careful experimental study under the title Ucber Flammenchutzmittel, in which he reviewed the action of twenty-nine water-soluble compounds, and seventeen substances insoluble in water, applied to strips of heavy filter-paper made of closely matted cellulose fiber. The record stated whether the strip burned with flame or glow, and the extent of such action.

Chemicals which have been recommended for flame-proofing combustible materials during the nineteenth century further illustrate the extent of the efforts made for the solution of the problem. A partial list of the recommended chemicals is as follows: ammonium sulphate, sodium chloride, iron vitriol, ammonium phosphate, sodium tungstate, borax, magnesium borate, caustic soda, alum, boric acid, and sodium carbonate.

### Methods of Treating

Modern methods of treating lumber to reduce its combustibility may be separated into two classes: surface and impregnation treatments. The surface treatments need no detailed explanation. Materials are applied by brush or spray and are intended to provide either a surface coating or to penetrate into the wood structure.

During the last fifty years several methods have been explored in an attempt to impregnate wood with chemicals. Among these was the Nodon-Bretonneau process, in which the timber to be treated was placed in a large tank and immersed, except for about one inch at the top, in a solution containing substances such as borax, resin, and sodium carbonate. The lumber rested on lead plates which were connected to the positive pole of an electric generator; the negative pole was attached to similar plates arranged on the upper surface so as to give good electrical contact, the circuit being completed through the wood. Under the influence of current, the sap rose to the surface of the bath, while the chemicals and resin took its place in the pores of the wood. This part of the process required from five to eight hours for consummation. The wood was then removed and dried in kilns or in the open air.

Timber ready for pressure treatment.



Other methods were attempted and are being used today, utilizing the natural characteristic of absorption of liquid by osmosis, or employing dipping in treating solutions, hot or cold.

At about the turn of the century, several plants were established in the United States for "fire-proofing" treatment of lumber by pressure methods. These plants were first located in the east; their erection was encouraged by the fact that the New York Bureau of Buildings required "fireproofed" wood in the construction of buildings over certain heights. In recent years, similar plants have been established in various parts of the country; they were primarily intended to impregnate wood with creosote and other preservatives, but at present are also used to treat wood with "fire-proofing" chemicals.

The typical apparatus used for these pressure treatments is a large cylinder, about 100 feet in length and 8 feet in diameter, closed at one end and with a removable head at the other. The lumber to be treated is loaded upon small trucks until it conforms approximately to the curves and the diameter of the cylinder, care being taken to obtain a somewhat open spacing in order to allow free circulation for the chemical solution with which the wood is to be treated. The wood and the truck are secured in position in the cylinder before the treating operation is started.

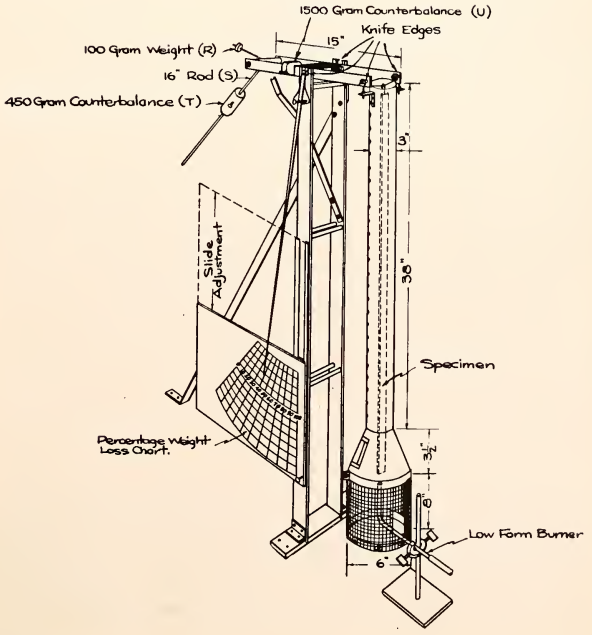
Some variations in the process have been developed in attempts to improve depth of penetration and distribution of the chemical, and to reduce injury to the wood fibers. In some cases, steam is injected into the cylinder to swell the lumber and open the pores, while in others the process is started by introducing the solution into the cylinder under normal or elevated pressure, or by evacuating the air gradually until a vacuum corresponding to about twenty-seven inches of mercury is obtained. This vacuum removes from the cells of the wood most of the air and some moisture. After a sufficient period of vacuum and/or steam treatment, which varies for different species and thicknesses of the wood, the vacuum is broken by inrush of the chemical solution at temperatures ranging from 100° to 200° F, depending on the formula of the solution used. A large percentage of the impregnation is obtained by prompt absorption, but when the flow into the cylinder has ceased, pumps are employed to force additional amounts of the solution into the wood. Pressure of about 100 to 250 lb. is employed. The quantity of solution absorbed by the lumber may be readily calculated and carefully regulated. After the lumber has absorbed the quantity of solution desired, the extra solution is removed from the cylinder and the lumber removed and permitted to reach normal moisture content by normal or mechanical drying.

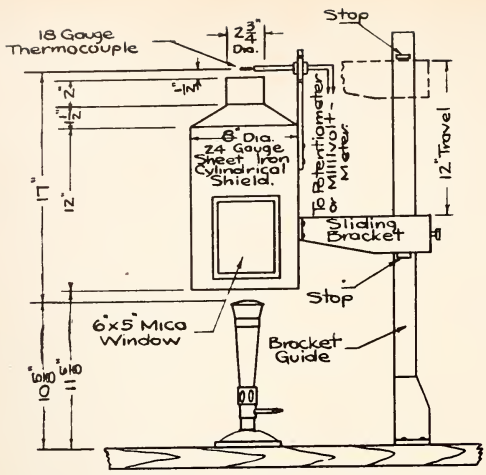
### Characteristics of Pressure Treatment

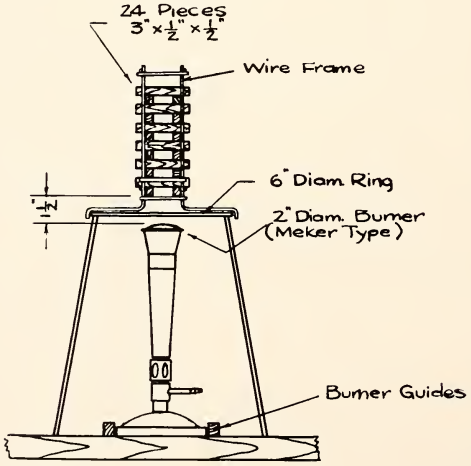
Generally, after the pressure-treating process has been completed, the lumber has a natural weathered appearance and is somewhat heavier than in its original state; in some cases it is rendered more difficult to cut with ordinary woodworking tools.

Certain of the chemicals used, which are not objectionably hygroscopic, rot the wood, while others rapidly corrode nails and metal fastenings which come in contact with the treated wood. The cost of certain chemicals makes them prohibitive. Other chemicals which seem to possess no serious defects, and which prove excellent in reducing combustibility of the materials, soon evanesce under atmospheric conditions, and articles treated with them burn as freely as before treatment. Practically all chemicals used will leach out under repeated exposure to water. The reaction of some of the chemicals used when subjected to intense heat indicates that they decompose and give off noncombustible fumes which mix with the flammable gases arising from the heated wood; other chemicals containing large amounts of water of crystallization, which is converted into steam create an atmosphere that will not support combustion. Chemicals that fuse at low temperatures provide a protective coating over the surface of the wood fibres and thus obstruct the pores of the wood and exclude oxygen necessary to combustion. In all cases, exposure to fire results in charring, similar to that developed on untreated wood, although flaming and burning characteristics are reduced to an extent depending on the type of treatment and the quantity of impregnant.

Fire tube test apparatus.






Special crib test apparatus.

### Measurement of Efficiency of Treatment

Since treatments to reduce combustibility of wood have been developed, many test methods to demonstrate their effectiveness have been contrived. In nearly all tests, small sample pieces cut from treated lumber are exposed to flame of varied intensities and for varied durations, and the loss of weight, depth of char, and time of glow and flaming are recorded. Detailed descriptions of these tests may be found in proceedings of various technical societies interested in the subject. The Fire Tube Test developed by the Forest Products Laboratory and the Special Crib Test developed by the Columbia University Laboratory are at present being used in many cases as means to determine compliance with specifications.

The Fire Tube Test apparatus consists essentially of a horizontal scale beam mounted on sensitive bearings at the top of a vertical rigid supporting column. The test specimen, 40 in. long, ¾ in. wide, and ⅜ in. thick, is suspended in a sheet-metal tube hung from one end of the scale beam, protecting the specimen against transverse air currents. The sheet-metal tube is open at top and bottom and flared at its lower end for attachment of a wire-mesh cage. The cage is slotted vertically for insertion of a bunsen burner of the Tirrell type, with horizontal mixing tube and upturned nozzle adjusted to deliver a flame 11 in. high (plus or minus ½ in.) blue in color, with a tall indistinct inner cone; temperature at the hottest region in this flame is 1000° C (1832° F) plus or minus 25° C (45° F). The bottom of the cage is a sheet-metal pan which receives and retains embers and fragments dropping from burning test specimens.

At the start of the test, the specimen and the tube are suspended in position, causing the tip of a pointer mounted at the center of the scale beam to swing toward the zero line of a chart graduated to indicate progressive loss of weight of the specimen as it burns.

The burner, with gas ignited, is placed directly beneath and 1 in. below the lower end of the test specimen, the burner flame thus enveloping the lower end of the specimen. The duration of flame application is 4 min., at the end of which time the burner is withdrawn from the cage.

Temperatures at the top of the tube, and percentage losses of weight, are the indices of the efficiency of the treatment. For untreated wood, the temperature is generally about 135° F and loss in weight 85 percent. For some treated wood, the temperature is about 375° F and loss in weight 20 percent.

The Special Crib Test employs a wire frame on which the test specimen, consisting of a crib of twelve tiers, each of two pieces one inch apart, is stacked and centered on a ring stand. If the test is made in an open room, a flame shield is placed around the sample; if the test is made in a draft-controlled room or in a hood, the flame shield is not used. A Meeker

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# SERVING THE ARMY AND THE NAVY

By

L. E. GRINTER

The Army and Navy educational programs have now been in operation long enough for us to evaluate their usefulness to the armed services during the war and to the country after the war is over. As we might have anticipated, because of the magnitude of these educational projects, there was considerable confusion during their initial stages. The Army tried to establish the Army Specialized Training Program (ASTP) in the colleges beginning in February of 1943 with almost no preparation either by the colleges or by the Service Commands.

Early in 1943, the colleges began to receive telegrams asking if they could be prepared to accept from 200 to 500 men as of February 20, March 10, or some other early date. Unfortunately, a few institutions accepted these telegrams essentially as letters of intent and prepared dormitories for the arrival of the AST students. In most cases the colleges were disappointed, for the Army found that the ex-college students in its ranks had been placed in essential jobs and were not available to fill the quota of the Army Specialized Training Program. After a period of confusion, the Army readjusted its sights, decided that most AST students would have to be drawn from high school graduates, developed methods of selection from among its young draftees, and established its program on a sound basis starting in most of its chosen institutions during July or August, 1943. The AST unit at Illinois Tech was established on August 9.

### Navy V-12

The Navy proved to be wise in its original decision not to establish any program before July of 1943. The Navy V-12 unit at Illinois Tech was commissioned on July 1. Of course, the Navy had large numbers of young men enrolled in its V-1, V-7, and other college reserve programs who could be transferred without loss into its new V-12 curricula and who actually filled considerably more than half of the initial quota. Other students were drawn either from the fleet or directly from high school graduates who were selected from nationwide tests available to all high school seniors. The Army also participated in this testing program, which produced large numbers of qualified students. By developing such devices, both the Army and Navy soon passed the bottleneck of obtaining trainees so that today far more students are available for furnishing replacements than are needed, even though standards of selection have been raised greatly.

### Student Selection

The first students entering both Army and Navy programs were on the average not well qualified for the kinds of studies that faced them. Army procedures for selection had placed little emphasis upon the students' training in mathematics, while the Army's accelerated program required the study of physics in the first term. Engineering educators had always known that the best criterion of success in physics and engineering is the student's grades in mathematics, but this information seemed not to have filtered into the services. The Navy, too, failed to require the standard three years of high school mathematics considered essential for entrance to most engineering colleges. In addition, the first Navy students, having been already enrolled in a Navy reserve program in some college, reflected only the entrance requirements of that college which, in many cases, were far below the entrance requirements of the leading engineering schools.

After unsatisfactory experiences with their first students, both services have successfully raised their standards for entering students. Opinions differ as to which service is now obtaining the best qualified students, but the question is not very important since both the Army and Navy now send students of good quality to the colleges. It is still doubtful whether the mathematics preparation of the entering military students is equivalent to that of our civilian students, but it seems probable that the general intellectual level of the military students is somewhat above that of the civilians. We may, therefore, strike a balance and say that the Army and Navy students are now of about the same caliber as were the civilian engineering students before the war.

### The Curricula

The Navy essentially accepted the typical curricula in civil, electrical, mechanical, and aeronautical engineering for its Engineer Specialist Candidates. Such curricula are eight semesters in length. The curriculum for General Engineer Candidates is six semesters; Deck Officer Candidates study for four semesters, and Aviation Candidates are given but two semesters. Most of the V-12 students are expected to continue for either six or eight semesters, completing the General Engineering curriculum or one of the Engineer Specialist curricula. Evidently, those students who graduate as Engineer Specialists will be qualified engineers eligible to enter the ranks of professional engineers after the war. General Engineer students can return to college after the war and complete a standard engineering curriculum in two or three semesters.

The Army accepted the philosophy that this might be a short war and that its students would have to be trained in a short period of time if they were to be useful in this war. Accordingly, its longest curriculum (electrical engineering) is but seven terms of twelve weeks, which is the equivalent of about five semesters. Other engineering curricula are set at six terms. In addition, the Army has stated clearly that most of its students will complete only basic training, which continues for but three terms or nine months. Recent estimates have lowered to twenty or twenty-five per cent the number of students who will continue into advanced engineering study. It is further stated that the objective of officer training, which is the end point of the Navy V-12 program, is no longer considered a main objective of the ASTP but that these youngsters will be eligible for further training for technical assignments in the Army. It seems reasonable then to picture the AST student as likely to complete three terms of basic study, after which he may be selected either to continue into advanced ASTP engineering (or medical) study or be assigned to the study

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# INDUSTRIAL TRAINING—WAR STYLE

By

J. H. HAZLEHURST

That nobody likes war is a truism; that is is an ill wind that blows nobody good is a truism. Certainly, as anyone in industry knows, wars, however undesirable they are, have as a by-product great technological developments. These developments however are not, as many believe, confined solely to the purely engineering phases of our economy. Many developments as dramatic, if perhaps not quite so visible, occur in what we may call the management aspects of industry as well as in production aspects. New techniques in the field of management, as well as new products, have come from past wars and are emerging from this war.

A specific phase of management work is that of personnel control. In World War I, the technique of using aptitude tests for the selection of employees followed the extensive wartime application of this procedure by the Army in its use of the famous Army Alpha intelligence test and its many trade tests. The great need for developing quick and simple selection instruments made it necessary to develop these testing procedures, and their soundness was so firmly established that they were carried over into industry, where, in the more leisurely tempo of peace times, they were expanded and refined until they became an established part of modern personnel procedures.

Undoubtedly, the great contribution to the field of personnel that will emerge from World War II is the development of streamlined single-purpose training procedures. This development has been a natural outgrowth of the fact that this has been primarily a production war as far as this country is concerned. Furthermore, the peculiar production needs of this war were intensified by the long depression period of the thirties. Even before Pearl Harbor, when American industry began to get into high gear, it was evident that there was a great shortage of people skilled in the manual and mechanical trades, owing to the fact that during the depression period many people had shifted to other lines of endeavor and that there had been a general reduction in the training that was done to provide people with the skills demanded by these trades. The result was that when industry faced the tremendous expansion demanded by the war, there were not enough trained mechanics, machinists, and machine-tool operators to turn out the materials demanded by our forces and those of our allies.

The solution of this problem, broadly speaking, was found through two industrial techniques, one in engineering and the other in training. The first, or engineering phase, consisted of replacing men capable of performing many skilled operations with people each trained to perform one skilled operation. A product that requires that a skilled mechanic perform several operations such as turning, shaping, drilling, and threading may frequently be set up in peace times as an operation to be performed by a single individual on a multiple purpose machine tool. In our new war production, however, the cycles of operation and scheduling of work flow were so set up that the product went from one man who was skilled in turning operations to the next who was skilled in the use of a shaper, from there to the man who was skilled at drilling, and finally to the one who was skilled in threading. These men have commonly been termed production specialists. This change in the engineering of the product made it possible to limit training of an individual to a single skill and thus enable him to get into production quickly and effectively.

This change in engineering practice in a very real sense passed the production problem along from the engineering department to the training department in industry, and to meet it, it was necessary for those in training work to develop new techniques and new methods for tackling their task. This was no small job. In each of the years 1942 and 1943, approximately 12,000,000 people went into war industry. Thus, in the space of two short years, it was necessary for companies in war work to train about 25,000,000 people in new jobs. Many of these people had never before worked in plants and factories; approximately half of them were women, and the need for rapid, sound training programs was thrown into sharp relief.

While the larger manufacturing establishments of this country made many valuable contributions in undertaking this gigantic task, great credit for the rapid and efficient carrying of this training objective must be given to the Training within Industry Service of the War Manpower Commission. Starting as a small organization back in the days before Pearl Harbor under the auspices of the Office of Production Management, manned by men long schooled in the training departments of American industry, Training within Industry has carried its programs into every war activity from one end of the country to the other.

Its philosophy and approach to this problem were as simple as they were effective. It recognized that there were not enough people skilled in training work to train directly the 25,000,000 new workers that would have to be shifted to war production work. It determined therefore upon a two-step approach. The plan was to have the foremen in industry take over the training of the 25,000,000 new workers and to have those who made training their jobs concentrate upon teaching the foremen how to undertake this job. Thus, job training, or the training of new workers, was undertaken by the development of formal training programs at the supervisory level.

In this undertaking, first things were placed first. The traditional supervisory training program of peace-time American industry has usually been in the form of long-term

conference programs designed to teach foremen the many phases of their work. For example, a typical foreman-training program of a large company would consist of two-hour conferences held once each week for thirty weeks, covering such subjects as the supervisor's place in industry, the development of wage systems, the responsibilities of the supervisor under the Wagner Act, the elimination of waste, the handling of problems with employees, the training of employees, the planning of their work, and other similar topics. Those companies that attempted early in the war effort to follow this conventional program immediately ran into difficulties. It was found that, as their organization expanded, supervisors would be moved from one shift to another, from one department to another, that new supervisors were constantly being appointed, and that a long-term program could not be maintained in the face of constantly shifting schedules.

Foreseeing this, Training within Industry adopted the policy of developing short, intensive, streamlined, single-purpose training packages to replace the less flexible conventional training program. It was recognized that in general the well-rounded supervisor needs as basic equipment two knowledges and three skills, namely, the knowledge of the technical aspects of the job to be supervised and general institutional knowledge concerning the company, its policies and procedures, a skill in training men, a skill in planning work, and a skill in leading. These, in fact, were the materials ordinarily contained in the traditional training programs of peace times. The immediate need in industry's tooling-up period was, however, skill in training new workers. For this reason, the first training package developed was concentrated on this skill, and it resulted in the formulation of the widely-known Job Instruction Training program. It consisted of five two-hour conferences in which a foreman was taught how to break down the jobs which he supervised into their various steps, and to determine what were known as the key points of each step. Having done this, the foreman was taught how to teach these steps and key points to the new worker in the quickest and most effective fashion. That there was a great need for this particular skill on the part of supervisors is attested by the fact that within a year, over half a million supervisors in American industry were given these five two-hour conferences by their management under the direction of Training within Industry. Although no one man can ever be responsible for the final form of any industrial product, nevertheless, the creator of this program in its basic concepts was Mr. Glenn Gardiner of the Forstmann Mills, Passaic, New Jersey.

The success of the Job Instruction Training program established package training as a new, flexible, and efficient tool in the hands of competent training men. By replacing the older and lengthy supervisory training programs with a number of intensive training packages, training departments could arrange these components into combinations that would meet their own specific and peculiar needs and rearrangements could be made on short notice to meet changing conditions. Furthermore, new packages could be added as new needs arose. Another extremely important characteristic of these training packages lies in their construction. They were highly formalized and set up to conform to a rigid pattern with the result that people with little experience in training work could very quickly learn to administer these packages in a satisfactory fashion. Many companies discovered that they could expand their training forces in an effective way by having people who were not full-time training men learn to lead these ten-hour conferences and take them to their supervisory groups.

As was pointed out above, package training could be quickly adapted to shifting needs. As industry got past its tooling-up stages and new employees were finally gotten on the job, and as war products began to roll from the production lines, industry began, late in 1943, to find its personnel problems shifting from recruiting to manpower utilization. The need no longer was simply that of getting men to learn their immediate jobs but to teach them better methods of work, better methods of planning, and to develop better working relations. To meet this shift in need, Training within Industry brought out its Job Methods Training package, which, in essence, was a streamlined form of motion study to teach supervisors the elements of job simplification. A typical successful application of the Job Methods Training program is reported by Lieutenant Colonel White, Administrative Officer of Picatinny Arsenal. Colonel White reported that the job improvements resulting from the first Job Methods Training programs at the Arsenal resulted in a saving of over half a million dollars in 1943, and that these improvements passed on to the other Ordnance establishments would result in savings of many times this amount.

Another package developed by Training within Industry was Job Relations Training designed to teach supervisors how to handle grievances. Since its inception over 150,000 supervisors in American industry have received this training, with the result that many companies have reported material decreases in the number of grievances reaching the higher steps in their grievance procedures. While the Training within Industry Service has developed only these three packages, other organizations have explored this type of training to the extent of constructing packages for their own use. As an example, the Safety and Security Branch of the Office of Chief of Ordnance has developed a ten-hour training program in the field of safety for use in Ordinance establishments throughout the country, and has found it to be extremely effective in reducing accident rates in these establishments. Mr. Glenn Gardiner has developed an eight-hour conference package on waste elimination for use by his company and for others in New Jersey which have felt the need for this kind of training.

The only real weakness of package training that has been reported by those in the training field has been the difficulty in developing a sound integration of these programs into a unified training whole. It is felt, however, that this is largely a matter of administration and follow-up. There may be a reversion in peace times to the more traditional type of supervisory training, but certainly, when industry faces its conversion problems anew at the end of the war, this package-type training will be a powerful factor in speeding up the change-over and in putting people back into their peace-time activities.

It has often been estimated by those who have watched the spread of new developments that it takes twenty years for something new to finally reach the last outposts as an accepted operation. Whether this can be be looked upon as any more than the roughest sort of a figure is doubtful. Using, however, aptitude testing as an example, it is true that it took twenty years after World War I for this type of testing instrument to gain any wide-spread recognition among smaller companies. So, undoubtedly, many years will pass before the new training instruments developed in this war will be thoroughly accepted throughout all strata of American companies. This is due of course to a certain inflexibility and conservatism in managerial thinking. As a matter of fact, one could well doubt whether sound training itself has been accepted by many companies in this country. A survey made by the Chicago Association of Commerce in

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# BETTER MOUSE TRAPS

## A New Wear-Test Automotive Engine

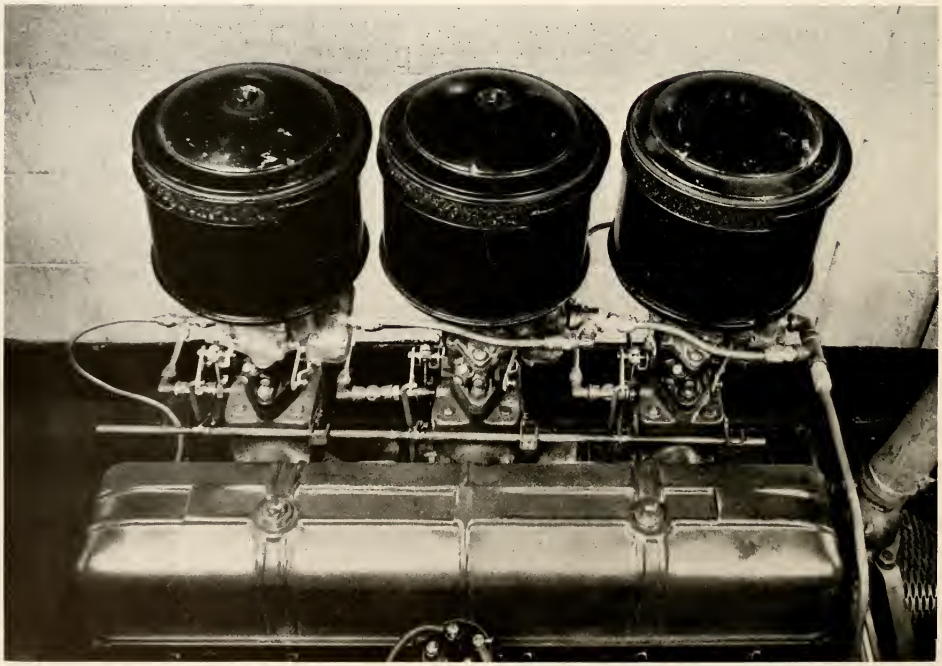
By

NORMAN C. PENFOLD

The reduction of wear in internal-combustion engines is the subject of considerable study and investigation in the laboratories of many engine manufacturers and fuel and lubricant refiners both in this country and abroad. Some internal-combustion engines may be operated for extended periods and experience very low rates of wear; other engines, by reason of their construction, conditions of operation, or because of the type of fuel or lubricant used, have high rates of wear. Although the causes of wear may fall into rather well-known categories, the problems involved are sufficiently important to occupy the attention of investigators in many fields of endeavor. The metallurgist, the engine designer, the lubrication engineer, the fuel refiner, and the operator all share in the responsibility of maintaining satisfactory engine performance over prolonged periods of operation. In general, the term "wear" encompasses the range of phenomena from a gradual removal of metal from contacting surfaces to the extreme cases involving spalling and scuffing and the eventual destruction of the mating parts. It is with the former type of wear that the Armour Research Foundation engine laboratory has been most concerned.

In studying the problem in the laboratory, certain difficulties are encountered in choosing an evaluating procedure which correlates with manufacturing and field experience. The many "bench" type test machines which have been used to measure wear characteristics have generally proven unsatisfactory. The operation of full-scale engines for this same purpose presents problems because of slight differences in engines and the difficulty of operating the same engine repeatedly under exactly duplicated conditions and obtaining reproducible results.

The engine research laboratory at the Foundation has developed a test engine and a testing technique which are being used to evaluate the wear characteristics of additives designed to be incorporated in the fuel supply in very small amounts. Both the engine and the technique have been the result of preliminary investigations



View of specially fitted automobile engine for laboratory wear studies.

made in the engine laboratory over a period of two years.

Briefly, the test engine used in these investigations is a specially fitted six-cylinder Chevrolet 1942 passenger-car engine. The conventional intake manifold and carburetor are replaced with three intake manifold assemblies, each having its own carburetor and each supplying two of the six cylinders. This arrangement allows the engine to be operated on three different fuels at the same time, a separate fuel being supplied to each pair of cylinders. It also permits adjustment of the load carried by each of the pairs of cylinders and allows for control of the air-fuel ratio in each of the three pairs. For comparative studies on additives the load between pairs is balanced and the air-fuel ratio is usually controlled at the same value for all.

Since additives introduced into the engine via the induction system and combustion chamber will find their way into the crankcase, it is sometimes necessary to operate the engine so that the lubricating oil supplied to the engine is not recirculated but is supplied to the engine from an exterior source and is allowed to drain from the properly baffled sections of the crankcase and to be discharged to waste. This procedure prevents the distribution of additives which find their way into the crankcase to other cylinders via the lubricating oil circulating system.

The use of the three pairs of cylinders in this test engine for evaluating fuel additives eliminates some of the difficulties generally encountered. First, the differences between the wear rates obtaining between the cylinders of an engine are less pronounced than those from different engines of the same type or from the same engine operated according to the same procedure time and again. Secondly, there can be no question about the sameness of piston speed, total number of revolutions, inlet-air temperature, jacket-water temperature, etc. If different cylinders are found to give different results, an average result may be obtained by switching cylinders and making repeat runs.

The testing procedures used vary with the manner in which the additives are designed to function to reduce engine wear. For instance, for additives which function as powerful anti-oxidants to reduce the metal corrosion occurring when engines are operated at low temperatures, the test procedure becomes one involving rapid cycling operation with a great many starts and stops, and with a jacket-water temperature low enough to precipitate corrosive action in the combustion chamber.

The wear characteristics are evaluated largely by precision measurements made to determine cylinder wear, piston-ring weight loss, and piston-ring gap increase, and by a careful inspection of other parts for evidence of abnormal performance. Since the usual laboratory investigation must be limited to a series of short-term tests, the wear will in most cases be quite small and the usually available measuring instruments are not satisfactory for an evaluation of this effect. A highly accurate and convenient instrument for measuring cylinder wear has been developed at the Foundation, however, and this instrument makes possible the rapid determination of the wear in cylinders regardless of whether the tendency is for them to become tapered, out-of-round, irregular, or to assume some combination of these deformations.

Indications are that the test engine and testing techniques will be definite contributions as both laboratory tools and the means of correlating laboratory and field service data.

# HAVE YOU ANY FOREIGN MAPS?

The War Department is searching for foreign maps of ALL areas outside of continental America, to be used by Army Map Service, Washington.

### NEEDED

City Plans and Port Plans on a scale of not less than 1:25,000.
Road Maps, Topographical and Geological Maps not smaller than 1:1,000,000.
Important Foreign Atlases.
Guide Books, Place-Lexicons, Gazeteers and Postal Guides.

### NOT NEEDED

Maps printed in the United States or Great Britain, such as National Geographical Society, etc.
World War I Maps.

The more recently issued publications are preferred.

Please state whether your material is a gift to the War Department. If you prefer to lend it, reproduction will be made and the originals returned to you.

**Forward material to office in your area.**

Chicago Library Branch
ARMY MAP SERVICE
79 W. Monroe Street
Chicago 3, Illinois
Central 3240

New York Library Branch
ARMY MAP SERVICE
1270 Sixth Avenue
New York City 20, N. Y.
Circle 6-4250

San Francisco Library Branch
ARMY MAP SERVICE
74 New Montgomery Street
San Francisco 5, Calif.
Exbrook 2009

## WISHNICK-TUMPEER, INC. CHANGES NAME TO WITCO CHEMICAL COMPANY

Wishnick-Tumpeer, Inc., New York manufacturer and distributor of chemicals, pigments and asphalt products, has changed its name to WITCO CHEMICAL COMPANY. No changes in corporate structure, management, or personnel are effected by the change in name, which is based on the company's long established trade-mark "WITCO."

Since its founding in 1920, Wishnick-Tumpeer's development in the chemical industry has been characterized by a continual expansion of its manufacturing facilities as well as by the extension of its line of chemical products.

In 1926 Witco acquired the Pioneer Asphalt Co. plant in Lawrenceville, Ill.; this was followed in 1933 by the purchase of the Panhandle Carbon Co. in Borger, Texas, where Witco carbon blacks have been manufactured ever since. Four years ago a new research laboratory and a plant for the manu-

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The Institute of Gas Technology, for the remainder of the war, will be devoted almost exclusively to basic and sponsored research in the interests of the gas industry of the United States. Since February 15, it has no longer been possible for full-time graduate students in engineering or science to obtain deferment under the new Selective Service regulations, because the revised directives provide only for the continued deferment of a small group of undergraduates throughout the entire nation, with no consideration for graduate students. Accordingly, the twenty young men who have been studying during the past term at the Gas Institute have been released for service in the armed forces, or for work in essential war industries. The five second-year Fellows who are within reach of their Master's degree will continue their thesis research on an intensive basis, and it is hoped that they will be able to complete this work before they change their status by entering the Navy or by going into war industry.

When the definite decision of Selective Service was conveyed to the administration of the Gas Institute, arrangements were made to have a representative of the Office of Naval Officer Procurement visit the Institute, and interview the entire student group. It was found that seven of the Fellows could pass the stringent physical examination of the Navy, and accordingly it appears that the U. S. Naval Reserve will be strengthened by the addition of seven first class gas technologists. The two third-year Fellows, Messrs. Robison and Newhall, will remain with the Institute of Gas Technology to participate in the basic research program, and the thirteen remaining Fellows will be scattered, literally, to the four corners of the earth. Many of them have made applications for positions in the newly created Field Service Division of the Office of Scientific Research and Development. It is contemplated that these men will be sent all over the world to observe the performance of newly developed weapons, and to report on their action to the OSRD in Washington. In this manner, these men will be putting their scientific training to direct use in the war effort. Several other first year Fellows have already entered the service of the research laboratory of the Standard Oil Company of Indiana, where they also will be able to participate directly in the war program by helping in the production of high octane aviation gasoline.

This interruption of the educational program of the Institute of Gas Technology is an inevitable consequence of the changed emphasis of Selective Service. Although it is regretted that the educational program has had to be discontinued for the duration, nevertheless it is contemplated that the program will be re-established on an expanded basis when conditions permit. Most of the Fellows have indicated a definite intention to return to the Institute and to complete their program when the war is over. Although it now appears that most of the Fellows will either receive Naval commissions, or will go immediately into essential war industry, several Fellows have already received 1-A classifications, and it has been established as a policy of the Institute that an extra one-month's stipend will be paid to any who are taken into the armed services as private or ordinary seaman.

It is believed that, in the immediate postwar period, there will be great interest in the Fellowships of the Gas Institute, and accordingly plans will be laid to put the educational program back into high gear just as soon as the departing Fellows are available again. Expanded and improved facilities will also be a continuing obligation of the Gas Institute, and it is expected that new equipment for combustion laboratory and fluid-metering laboratory work will be provided. Also, additions to the permanent staff of the Gas Institute will be made with a view to strengthening the teaching force.

One of the major responsibilities of the institute of Gas Technology is the carrying out of basic research in problems of interest to the gas industry as a whole. Under the direction of Mr. Benjamin Miller, chairman of the Division of Basic Research and Education, and with the active participation of Dr. Vasili Komarewsky, a comprehensive program of basic research projects has been established. Three of these projects will be in the general field of catalysis, and this work will be performed by Charles Riesz, Armour 1935, Ph. D. 1939. Working with Dr. Riesz on these projects will be Mr. Henry Robinson and Mr. Robert Newhall. The first of these projects will be related to the use of activated carbon as a carrier for catalysts, probably making use of the fluidization technique which is now in wide use in the gasoline cracking field. Work will also be carried out on the Fischer-Tropsch synthesis, with the intention of developing catalysts which will direct this important reaction in specific channels. As an adjunct to the extensive program which is now being carried out on the organic sulfur removal project, work will be pursued on catalytic methods of de-sulfurization. Special facilities will be made available for these three related programs, so that the work on the synthesis of carbon monoxide and hydrogen can be done under safe circumstances. It is customary in work of this nature to have a cage of canaries in the laboratory, not only to inspire the workers to greater efforts, but also to inform them if, by some mischance, some carbon monoxide is liberated.

Work will also be carried out under the direction of Dr. Komarewsky, and with the services of Mr. Charles Schaar, on the destructive alkylation of propane. This gas, which is present in relatively large quantities in natural gas, has great potential value as a source of chemical materials, and also as a raw material for the manufacture of high octane aviation gasoline. Work which has already been started on this project by Dr. Komarewsky and Mr. Thomas Pelican, a second year Fellow of the Institute, will be expanded.

In an entirely different field, work originally started some years ago by the Armour Research Foundation in the explosion pulverization of coal will be carried on, using some newly developed techniques. This work will be carried out by Mr. A. D. Singh, and Mr. Lawrence C. Bischmann. An entirely new approach to the generation of intense super-sonic radiation is also being carried out by Mr. L. E. Savory, a second year Fellow. The results of this investigation are expected to be of great value in a wide variety of fields, including metallurgy, purification of foods, preparation of emulsions, and other fields wherein gas heat may be usefully applied.

It is expected that the results of these investigations will be made public from time to time in the periodicals devoted to the gas industry and in publications of the Gas Institute.

J. I. Yellott.

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# 1944 RED CROSS WAR FUND

When bombs fall there is no time to send help half way around the world. When a badly wounded fighting man needs a transfusion, it is too late to begin looking for a blood donor or for a nurse to care for him. When a lonely soldier learns of trouble at home, he needs help—immediately.

The American Red Cross provides that help wherever and whenever the need arises. A continuous procession of blood donors must be maintained, nurses must be recruited for the Army and Navy, trained Red Cross workers and supplies must be sent to camps, hospitals and foreign theaters of operation the world over.

When a train crash leaves scores injured, when flood engulfs a town, when epidemic strikes, delay may cost lives. Red Cross disaster relief and medical supplies, held in readiness for such emergencies, plus trained workers to rescue and assist victims and help in their rehabilitation, will prevent delay and thus save many lives.

To fulfill its many obligations to the armed forces and our people, the American Red Cross needs your help. During 1944 it must supply some 5,000,000 blood donations. Each month 2,500 nurses must be recruited for the Army and Navy. Red Cross field directors and other trained personnel must be stationed at military and naval posts and hospitals to help our fighting men and their families when personal trouble brews, a task in which the Red Cross chapter on the home front ably does its share.

At home the Red Cross must continue to maintain a state of alert. Disasters must be met as they occur. Nurse's aides and first aiders must be trained and other educational projects continued. Food parcels for distribution to prisoners of war must be packed, surgical dressings made, and the thousand and one details of administering a far-flung, busy organization must be attended to.

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# HELP! HELP! HELP!

By

JOHN J. SCHOMMER

The Army must have men. The Navy is in the same plight. Both must have food. In order to fight, both must have something other than bean blowers, sling shots or rocks.

Both must have water craft of all kinds, up to the hundred-million-dollar battle wagons two to three blocks long. Both must have long-range guns; some shoot so far it is claimed all that is needed is the enemy's address. The armed forces must have tanks by the tens of thousands; airplanes by the tens of thousands; ships of every description by the thousands; automatic rifles and machine guns by the hundreds of thousands; shells and bullets by the billions; bombs—incendiary, fragmentation, block busters—by the millions; parachutes by the tens of thousands; automotive vehicles such as jeeps, self-propelled guns of every description, motorcycles, automobiles, trucks to carry soldiers' food and ammunition, ambulances, and amphibious vehicles all by the millions, and recording instruments by the millions. All of these and countless thousands to millions of other necessities show that this war is the most highly mechanized ever fought. Somewhere in print it has been said that it cost fifty cents to kill a soldier in the the early Roman wars; in this World War II the cost to kill has risen to $50,000 per soldier.

A big bomber crashes. There goes from three hundred thousand dollars to a half a million. Each big bomber has a crew of ten men. It costs $35,000 and upwards to train each of the crew of ten men. So when fifty to eighty bombers are lost in a raid, the cost of raiding an enemy country for a year amounts to an astronomical figure.

Mechanized warefare needs engineers and men of science. It needs research by trained men to invent, create, and produce new and better materials for offensive and defensive warfare. Our creations are not frozen; they are in a constant state of flux. Many of our creations coming off the production line now are a year behind the new designs. New machinery, new tools, and new production are constantly in the making. The better equipped our armed forces are, the speedier this war will end.

The National Roster in a recently published article reported that there are 280,000 living engineers of all professions in the United States. You read much of the civil, mechanical, electrical and chemical engineers but little of the petroleum, agricultural, marine, ceramics, fire protection, industrial, architectural and many others, all included in the 280,000. Many of the 280,000 listed as engineers are not holders of a B.S. degree from an accredited engineering college, but have taken some day or night school courses and by long years of experience, have qualified as fulfilling the requirements of the professional engineering societies, and have been accepted and listed as engineers.

The National Roster further stated that in an incomplete survey fewer than fifty per cent of these 280,000 were of military age. Many of the engineers (about twenty per cent) are already in the services of the United States. This still further cuts the available engineers for industry. But industry also needs men, and women who can do men's work. With increased production schedules, industry has a most urgent need for engineers.

The noncombatants (men, women and children) also need engineers and men of science. Somebody must attend to the needs of defense workers. They need food, clothes, gas, electricity, transportation, safe water to drink, proper disposal of sewage, and other attentions that require the services of trained men.

When the armed forces want a registrant and industry wants him also, who decides the issue? The Local Boards of the Selective Service System usually act as referee. The Local Boards are all-powerful and most of them have done a grand job under the most trying circumstances. If you do not think you are receiving a square deal from the Local Board, you may appeal to the Board of Appeals, then to the State Director and last to the Presidential Appeal Board.

In this land of democracy, industry has existed through the survival of the fittest, by means of research, invention, sometimes political intrigue, favorable tariffs, or by making the best and cheapest useful product on this earth. Most of the time each industry has been organized for its own survival and not to help other industries. But if production schedules are to be met, new creations invented and developed, industry had better get together in a common cause to fight for key men as scientists, engineers, tool makers, etc. This fight means organization to publicize by newspapers, radio, letters and telegrams to your Local Boards, to State Directors, to the War Manpower Commission, General Hershey and your Congressman. If production cannot be maintained, show everybody why and put the responsibility in someone else's lap. If you do not organize and publicize your troubles and show the public and Selective Service System your difficulties, you will be blamed if your production falls to a dangerous level.

You know the bulletins pertaining to the critical occupations. You know the bulletins regarding young engineers. Put some competent men in charge of all your draft problems. Don't fill out Form 42-A vaguely. Don't let some stenographer (thinking of her boy friend at sea) tend to your Selective Service problems. It takes all of the wit, diplomacy, intelligence, and perseverance anyone has to argue and battle each case separately. You will find most draft boards intelligent. Some you will have to educate as to what an engineer or scientist means and what they accomplish in your plant. You may find some members of Local Boards who think engineers run elevators, street cars, or motor buses, or are janitors tending a boiler or a few

pieces of machinery. You may find some boards that know little of college. Some think that a college is a country club for rich men's sons and daughters who attend for a good time. (Some educators think likewise.) You will find that one Board will defer your employee and another Board on a similar case will put the registrant in the army. That will happen with State Directors also.

Recently I was arguing the case of one of our Illinois Tech students before a Draft Board, attempting to obtain a deferment under the various state and national bulletins permitting this. I realized I was getting nowhere fast so I asked what their objections were. The Chairman said our Form 42-A said the lad was taking only eighteen hours a week in college, which was far too small a schedule in war time. I then explained that a semester-hour stood for three hours of laboratory work and sometimes many hours of calculations and writing up reports; that every semester-hour needed library work, theme writing, working math problems or preparing for the next day's recitations, and that every semester-hour the boy took meant an average of two hours preparation. So every student who takes eighteen semester-hours must put in an average of thirty-six additional hours, making a fifty-four hour week. This satisfied the Board and deferment was granted.

One of our February, 1944, graduates with a B.S. degree in mechanical engineering took the aeronautics option. This meant that he took, in addition to all of his regular mathematics, thermodynamics, advanced fluid mechanics, advanced strength of materials, aerodynamics, airplane design and airplane stress analysis. One airplane manufacturer couldn't get this boy past the State Director because the registrant was twenty-one years of age but another firm got the student accepted in another state. There is no rhyme or reason for this. But there is no rhyme or reason why one fellow in a boat will catch all the fish and the other occupant doesn't catch any. Or is there? Maybe it is the way the bait is wiggled by a competent fisherman, or maybe it is luck.

Some State Directors and Boards assert that anybody eighteen through twenty-one years of age will not be deferred unless the registrant is absolutely necessary to industry. Who in these United States is absolutely necessary? However, the loss of an engineer or the inability to hire one may slow up production of essential war materials.

What are some of the essential or critical materials right now? Nearly everybody reading the newspapers knows some or most of them. Certainly landing craft and ships of all kinds are urgently needed. Certainly bombers and fighter planes are urgently needed. This in turn means much increased necessary production for all accessories. Petroleum products, chemicals, medicines, are on the priority lists. Steel and its alloys, and the nonferrous metals for all sorts of fabrication, are urgently needed. There are, of course, many other essentials.

Remember to tell your Boards and State Directors that not all high school graduates, with diplomas from accredited high schools, may enter an accredited engineering college because they have not chosen to take some of the subjects, algebra, plane and solid geometry, chemistry, and physics that are required for admission. In the last three years this proportion has increased on account of the V-7 and V-12 Navy programs. But most of these freshmen entering engineering colleges have had to make up one or two deficiencies. So your college engineers graduating even today are not draft dodgers, but they started their engineering careers six to eight years ago. After entering college, out of every 100 freshmen, fewer than twenty-eight take their engineering degrees. This has been the record for the past forty years in the United States. So your engineer with a B.S. degree is an example of the survival of the fittest.

The various bulletins from selective service have recognized the necessity of maintaining a steady flow of engineers for industry and the armed services. They provided for the deferment of students in good standing in certain engineering professions. The directives said that deferment *should be considered* but none said *must be deferred.* The latter could not be ordered except by congressional enactment. So, many Local Boards gave 1-A classification to engineering students all through college. These cases for deferment had to be won by letters, appearances at Local Boards, letters of appeal to the Appeal Boards and Presidential Appeals.

Bulletins issued by the Selective Service System have said, "When a registrant has completed his training and preparation in a recognized college or university and has acquired a high degree of training, qualifications, or skill in one of these scientific and specialized fields, such registrant should then be given the opportunity to become engaged in the practice of his profession in an activity necessary to war production or essential to the support of the war effort." Thirty to sixty days were allowed in the various bulletins for a registrant to go to work. This time element now is thirty days. Nothing could be more plain than the intent of this directive. Further, it is now necessary for registrants eighteen through twenty-one years of age, who are employed in essential industry, to be qualified by State Directors in the respective states where the registrants are employed under Form 42-A Special. This form must be signed and O.K.'d by the State Director and then the Local Board must reopen the case and consider anew.

This new procedure and the headlines in the newspapers have created an erroneous impression that all males eighteen through twenty-one years of age must enter the service.

Now study the table below. It was issued by the Selective Service System and was published in many newspapers.

As of December 1, 1943, 11,836,000 men were deferred because of physical, occupational or dependency reasons.

Distribution was as follows:

| | |
|---|---|
| Total living registrants | 22,138,000 |
| In the service (inducted) | 6,540,000 |
| In the services (enlisted) | 2,430,000 |
| Disqualified after physical examination | 3,357,000 |
| In the process of classification, examination or induction | 1,090,000 |
| Deferred (occupational reasons) | 3,834,000 |
| Deferred (dependency reasons) | 4,645,000 |
| Deferred (other reasons.) | 152,000 |
| Unclassified and unknown. | 90,000 |

Besides these, approximately 1,000,000 youths attain eighteen years of age per year.

Now remember, three years ago the Illinois Institute of Technology had approximately 2,500 civilian full-time day students on its campus. Now, according to the national quota, our allotment is 239 plus a few 4-F's and a few under eighteen years of age. In this latter category, few students reaching eighteen years of age will be in a position to be considered in the quota of 239. Other engineering colleges are hit likewise.

If industry wants and needs young engineers to take the places of those retired by old age, accidents, and deaths, and the many others who cannot endure the social pressure and so enroll as candidates for officers' commissions or volunteer for the Army, and who go in when Selective Service

(Turn to page 52)

# MIDWEST POWER CONFERENCE

The Directorate of the Midwest Power Conference cordially invites you to attend the 1944 meeting of the Conference on Thursday and Friday, April 13-14, at the Palmer House, Chicago. This will be the seventh annual meeting of the Conference since its reorganization under the present sponsorship. The success of the annual meetings of the Conference is evidenced by the 2500 individuals who attended the 1943 meeting and by the increasing demand for its published proceedings.

If interested in any phase of power, you should not fail to attend the 1944 meeting. The Conference will be a stimulus to you—your presence will be a stimulus to the Conference. Remember that POWER PROMOTES VICTORY — PLANNING PROMOTES PROSPERITY.

The preliminary program of the 1944 meeting is given herewith. Inspect it carefully. It features an array of the best-known men in the field of power. You will want to hear them, know them, and enter into the discussions of their talks.

PRELIMINARY PROGRAM

Thursday, April 13, 1944

9:00 A. M. Registration, Palmer House.

10:15 A.M. Opening Meeting. H. B. Dirks, Chairman.

(a) Address of Welcome. Robert B. Harper, Vice President, Peoples Gas Light and Coke Company, Chicago.

(b) Response for the Cooperating Institutions. F. M. Dawson, Dean, College of Engineering, State University of Iowa.

(c) Postwar Planning of the Nation's Power Supply. Alex D. Bailey, Assistant to the Vice President, Commonwealth Edison Company, Chicago.

(d) Arrangements pending.

12:15 P.M. Joint Luncheon with A.S.M.E. J. P. Magos, Chairman. Speaker: C. O. Dohrenwend, Chairman, Engineering Mechanics Research, Armour Research Foundation, Chicago. "Review of Experimental Stress Analysis Methods."

2:00 P.M. Central Station Practice. R. K. Behr, Chairman. (Sponsored and arranged by the Power and Fuels Division, Chicago Section, A.S.M.E.).

(a) Progress towards Standardization of Turbogenerators for Central Station Service. M. S. Oldacre, Equipment and Research Engineer, Commonwealth Edison Company, Chicago.

(b) Causes and Prevention of Boiler Priming and Solids Carryover. W. H. Rowand, Engineer, Babcock and Wilcox Company, New York.

(c) Discussion.

3:45 P.M. Plant Maintenance. H. L. Solberg, Chairman.

(a) Maintenance Systems. W. A. Perry, Superintendent, Electric and Power Departments, Inland Steel Company, East Chicago, Indiana.

(b) Corrosion Problems. L. G. Vande Bogart, Research Engineer, Research and Development Laboratories, Crane Company, Chicago.

(c) Discussion.

3:45 P.M. Electrical Session No. 1. J. E. Hobson, Chairman.

(a) Studies of Generator Armature Insulation Deterioration. F. J. Pohnan, Senior Testing Engineer, Commonwealth Edison Company, Chicago.

(b) Temperature Deterioration of Solid Insulation in Oil. F. J. Vogel, Professor of Electrical Engineering, Illinois Institute of Technology.

(c) Discussion.

6:45 P.M. All Engineers Dinner. Informal. Grand Ball Room. (Ladies Invited).
Toastmaster: H. B. Gear, Vice President, Commonwealth Edison Company, Chicago.
Speaker: J. A. Krug, Director of War Utilities, War Production Board, Washington, D. C.

Friday, April 14, 1944

9:00 A.M. Industrial Power Plants. Hugh E. Keeler, Chairman.

(a) Application of Electronics to Power Generation. J. D. Ryder, Assistant Professor of Electrical Engineering, Iowa State College.

(b) Inhibitors in Condenser Tube Alloys. Austin R. Zender, General Sales Director, Bridgeport Brass Company, Bridgeport, Connecticut.

(c) Discussion.

10:30 A. M. Fuels. R. E. Summers, Chairman.

(a) Research in Fuels as a Postwar Necessity. A. R. Mumford, Development and Research Department, Combustion Engineering Company, New York.

(b) Postwar Outlook for Oil Fuels. Arch L. Foster, Refinery Editor, The Oil and Gas Journal, Tulsa, Oklahoma.

(c) Statistical Comparison of Fuels. C. C. DeWitt, Chairman, Department of Chemical and Metallurgical Engineering, Michigan State College.

(d) Discussion.

10:30 A. M. Electrical Session No. 2. R. W. Jones, Chairman.

(a) Developments in the Field of Control. E. H. Alexander, Engineer, Industrial Control Division, Industrial Engineering Department, General Electric Company, Schenectady.

(b) New Applications of Mercury Arc Rectifiers. W. E. Gutzwiller, Engineer in charge of Rectifier Application, Allis-Chalmers Manufacturing Company, Milwaukee.

(c) Discussion.

12:15 P. M. Joint Luncheon with A.I.E.E. F. E. Keith, Chairman. Speaker: B. W. Clark, Vice President in Charge of Sales, Westinghouse Electric and Manufacturing Company, East Pittsburgh. "Tomorrow's Outlook."

2:00 P. M. Electrical Session No. 3. L. B. Les Vesconte, Chairman. (Sponsored and arranged by the Power Group, Chicago, Section, A.I.E.E.)

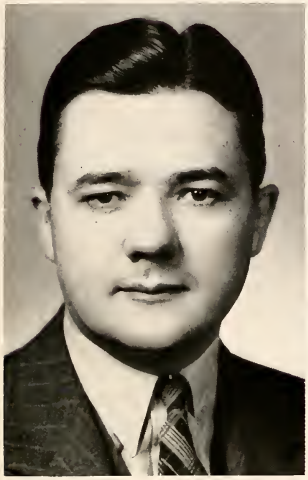
(a) Trends in Power System Analysis. Miss Edith Clarke, Central Station Engineer, General Electric Company, Schenectady.

(b) Ice Melting Practice on 132-kv Lines. H. A. Cornelius, Senior Engineer, Public Service Company of Northern Illinois, Chicago.

(c) Visualizing Heat, Magnetic, and Electrostatic Field Problems in Electrical Apparatus. J. F. Calvert, Chairman, Department of

(Turn to page 52)

# NEW FACULTY MEMBERS



FIESENHEISER



*Root Studios*

VOGEL

ELMER I. FIESENHEISER, Instructor in Civil Engineering, is a graduate of Purdue University with the degree B.S.C.E. He was engaged in research work in photoelasticity at the University of Minnesota, and has done graduate work at Illinois Institute of Technology. His professional experience includes five years with the American Bridge Company, working on details and design of steel buildings, bridges, and towers; six years with the United States Public Roads Administration as design checker of railway and highway bridges, including two large cantilever bridges over the Mississippi River; about eight months with the Sanitary District of Chicago on the design of the Southwest Sewage Treatment Works; and nearly two years as chief structural designing engineer in charge of steel and concrete design for Plancor 266, a defense-plant project in Indiana Harbor. He is a licensed professional engineer (Minnesota) and an Associate Member of the American Society of Civil Engineers.

WILLIAM A. LEWIS, JR., Research Professor of Electrical Engineering, and Consulting Electrical Engineer to the Armour Research Foundation, graduated from the California Institute of Technology (1926) and received the Ph.D. degree from the same institution in 1929 with the only *summa cum laude* citation ever given at that institution in electrical engineering. He was employed by the Westinghouse Electric and Manufacturing Company in East Pittsburgh, Pa., until February, 1939, as Central Station Engineer in charge of power systems engineering consulting work for the New England and Pacific Coast Districts. During that period he made notable contributions to power system relaying, analyses of system stability, calculation of conductor and transmission-line impedances, the derivation of transformer equivalent circuits, and network calculator studies. He resigned from his position at Westinghouse to become Director of the School of Electrical Engineering at Cornell University—a position he has held until this time.

Dr. Lewis is the author of numerous technical papers, is a popular technical lecturer, and has been employed frequently as a consulting engineer. He has been active on AIEE committees: on protective devices, 1933-43; power transmission and distribution, 1939-43; standards 1941-42; education 1939-40, 1941-42; basic sciences 1940-43 (chairman 1941-42); and research, 1941-43 (chairman 1943-). He has received honorable mention in the AIEE national best-paper prize awards.

FRED J. VOGEL, Professor of Electrical Engineering, graduated from the Massachusetts Institute of Technology (1915) in electrical engineering and was employed on naval ordnance construction during World War I. From 1919 until November, 1943, he was employed by the Westinghouse Electric and Manufacturing Company as design engineer, division engineer in charge of large power transformer design and development, and since 1940 as consulting transformer engineer. He has made pioneering contributions to the development and application of large power transformers, high-voltage testing transformers, and reactors. His work in connection with dielectrics and insulation, surge-testing of transformers and insulation, standards of transformer design and loading, heat transfer, and mechanical design problems has been particularly significant. He has recently made important developments in naval ordnance.

Mr. Vogel is the author of many AIEE and other technical papers and articles. He has taken active responsibility on the AIEE committees on electric machinery bushings; transformer (sub-committee), as chairman; electro chemistry and electro-metallurgy; and arc furnace overvoltages.

## OBITUARY

### Bernard L. McNulty

As we go to press we learn of the death, March 3, 1944, of Bernard L. McNulty, a trustee of Illinois Institute of Technology and of the Armour Research Foundation. Mr. McNulty was for the past twenty-five years president of the Marblehead Lime Company.

Mr. McNulty's home was at 720 Ashland Avenue, Wilmette. He is survived by his widow, Mrs. Elizabeth S. McNulty, and by three daughters, Mrs. John McNair, Mrs. Frank M. Bell, and Mrs. Frank S. Read.

# FROM YEAR TO YEAR

## A RECORD OF OUR ALUMNI AROUND THE WORLD

### MEN OF THE MONTH



H. WALTER FORSTER

In writing of H. Walter Forster, M.E., Lewis Institute, 1905, one is tempted to write about the family as well as about him, because his mother, Anna Forster, was for many years a beloved and able teacher of French and German at Lewis Institute, and his brother Harry and his sister Ilse both went to Lewis for a number of years early in the 1900's.

His father and mother, both German-born, met in America, and were married in San Francisco. They went to Los Angeles, California, where Walter was born October 29, 1883. A little later the family moved to San Diego, and from there, in 1892, to Duluth, Minnesota. Later, following the death of Hans Forster, the father, the family settled in Wisconsin, and in 1898, Walter, the first of the family, came to Chicago and entered Lewis Institute Academy. Walter stayed out of college the year 1901-02, working as a draftsman for the architectural firm of Daniel H. Burnham & Company; he was graduated with the degree of M. E., given in those days, in the class of 1905.

While in college, he taught drafting in night school, ran the machine-shop tool-room for one winter, and during the last two years was at school only part time because he was acting as chief engineer of a small manufacturing company. That he graduated with the rest of the class, after losing so much time, was largely due to the fact that he got credit for three years' German by passing a special examination. He recalls that if Dr. Jessie Jones had not been merciful in her phrasing of the examination, he would never have gotten by. He says that he could read, write, and speak German, but knew nothing about how he achieved those results.

Upon graduating from Lewis Institute, Walter went on with his work for the Multi-Vending Company, but soon transferred to the position of Engineer of Gases, Chemicals, and Oils with Underwriters Laboratories, Inc., the testing station of the National Board of Fire Underwriters, on the North Side in Chicago.

A year later he went to Philadelphia as chief engineer of a small professional organization, later known as Independence Bureau, which did advisory work in the field of fire prevention and fire protection. He continued to represent the Underwriters Laboratories in that area for some years. Independence Bureau later extended its activities to consultation in accident prevention, and later to industrial relations, and developed an organization international in character doing significant pioneer work.

While engaged in consultation in fire prevention, Forster took over the editorship of the Crosby-Fiske Handbook of Fire Protection, which thereafter also bore his name. He was editor of the sixth and seventh editions. This book in later editions continues to be the world's standard in its field. It is now published by the National Fire Protection Association.

Forster was for three years on the executive committee of the National Fire Protection Association, and chairman of various technical committees, including the committees on Safety to Life and on Building Exits. During these years also, and for a period of eight years, he was on the executive committee of the National Safety Council, helping build that organization from small beginnings to the leading national association in the field. In this association he also headed various technical committees, did considerable liaison work among national associations, helped organize the American Standards Association, wrote numerous articles, and made many addresses on the interrelated

subjects of fire prevention and accident prevention.

In 1919, Forster became a partner in the insurance firms of Henry W. Brown & Company and Brown, Crosby & Company of Philadelphia, and developed a life insurance department for them. From this, and his earlier training in industrial relations, he developed a keen interest in pensions for industrial organizations and began to specialize intensely in that field, which has taken most of his time for the past fifteen years.

Ten years ago, when the aforementioned firms were dissolved, he became a member of Towers, Perrin, Forster & Crosby, Inc., a Pennsylvania corporation, of which for some years he has been the president. One of the divisions of this corporation assists employers in devising pension and profit-sharing plans and is generally recognized as the leader in its field. Its clientele is "blue chip" in the very best sense of the word.

Forster has taken an active hand in trying favorably to influence legislation bearing upon pensions and allied matters, and with the help of his associates he has been of great assistance to the cause.

In addition to his work on the Crosby-Fiske-Forster Handbook of Fire Protection, and numerous committee reports and special addresses on fire prevention and accident prevention, Forster has, from time to time, made addresses on industrial relations before many associations; among these have been the following: *Experience with Group Insurance, a Basic Analysis,* delivered before the American Management Association; *Adapting Private Pension Plans to Social Legislation,* delivered shortly after the last amendment of the Social Security Act —again before the American Management Association; and *Pension Financing, a Fundamental Analysis,* delivered before the American Gas Association.

Years ago Forster spoke before a Lewis Institute general assembly on "Safety in the Home," and on April 13, 1935, he was requested on behalf of the alumni to deliver the address upon the retirement of Dr. Carman from the directorship of Lewis Institute.

Forster belongs to the Union League Clubs in New York, Philadelphia, and Chicago; to the Philadelphia Country Club, the Drug and Chemical Club in New York, the Lake Placid Club, and to numerous technical associations.

He is a member of the Unitarian Society of Germantown; for twenty-five years he was treasurer, and is now an honorary life trustee.

He was married in 1913 to Edith Hall, a graduate of Lewis Institute and the University of Chicago. After her death, in 1926, he married Sylvia M. Sachtjen, of Madison, a graduate of the University of Wisconsin.

His children are: H. Walter, Jr. (Harvard and University of Pennsylvania Medical School), captain in U. S. Army, flight surgeon of a fighter group now in Italy; Martha Forster Mertz (Radcliffe and Wisconsin); Elizabeth Forster Stephenson (Mills College and University of Pennsylvania); William Hall Forster (Harvard), radio research engineer; Richard Hall Forster (Harvard), private, U. S. Army; and Robert Wilbur Forster, now in prep school. One of the sons-in-law of the Forster family is a Harvard man, and the other a graduate of Princeton. All the sons at Harvard have, of course, known a former Lewis student, George Birkhoff.

While at Lewis Institute, Forster was president of the Engineering Society, the Parnassan Society, and the Glee Club; he was actively interested in promoting the candidacy of the Parnassan representatives against all comers when it came to be the Allen C. Lewis Society.

Forster recalls with great happiness the years at Lewis, although they were unusually strenuous, and like most college graduates, he has built most of his closest friendships upon those days. Like so many of the "old guard," he valued the friendship of the faculty and the pleasantly informal relations between them and the students.

In spite of the fact that he is getting fairly close to the "Normal Retirement Age," which is stipulated in the pension plans that his organization helps to establish (incidentally, his corporation has an excellent plan of its own), Forster, nevertheless, is today carrying a heavier load than ever before, and does not seem to have suffered unduly because of thirty-eight years of vigorous activity since he was graduated from Lewis.

Like most men who have had an opportunity to go to college partly because an institution made it possible for them to work their way through, he has been unqualifiedly grateful for the opportunities that were given him, and for the beneficial effect which the education and other training of necessity have had on his professional career. The Illinois Institute of Technology is pleased to include H. Walter Forster in its list of distinguished alumni.

Howard A. Carter.



ROLLAND McCARTNEY HESKETT

The Engineer presents as man of the month, Rolland McCartney Heskett, a graduate of the Armour Institute of Technology, Class of 1902, in Electrical Engineering. He is president of the Montana-Dakota Utilities Co., which owns and operates extensive natural gas and electric public utility properties in the states of Montana, Wyoming, North and South Dakota, and Minnesota.

Heskett was born near Cambridge, Ohio, and attended grammar and high schools in that city. His father was a practicing physician; following his death, the family moved to Chicago. Before entering Armour, Heskett was employed for several years as superintendent of the Fort Howard, Wisconsin, power plant. While at the Institute he was a member and president of Phi Kappa Sigma fraternity.

After graduating from the Institute, Heskett was employed by the Knox Engineering Company of Chicago; later, until 1913, he was engaged in general electrical engineering and consultation work, largely having to do with the construction of street railway and electric utility properties. He became a member of this firm in 1905, whereupon the firm name was changed to the Knox-Heskett Company. Between 1903 and 1911 the company completed the construction of various electric interurban lines and electric power plants in the central states. Among these were the electric interurban line and electric power plant at Green Bay, Wisconsin, and the street railway system at Wausau, Wisconsin. During the period

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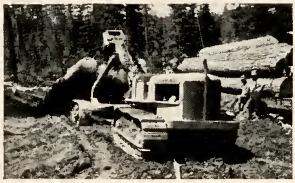
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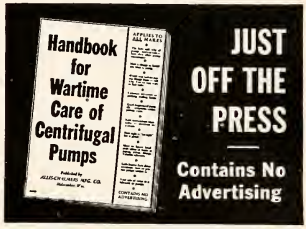
Allis-Chalmers is the largest supplier of sawmill equipment in the world!



A-C equipment puts rivers to work—supplying power for the war effort!

# VICTORY NEWS

**Converted Carriers Aid Navy!** Official Navy Photos reveal that merchant vessels are rapidly being converted into auxiliary-aircraft escort ships to protect convoys from subs and bombers. On some ships already converted a great variety of A-C equipment has been installed—including main propulsion turbines, auxiliary generating sets, condensers, centrifugal pumps, motors and control.




**FREE!** Write for your copy of this centrifugal pump maintenance guide! Jam-packed with *practical* suggestions—new ideas you *need* today! This valuable new book belongs in *your* technical library!

**New "Electro-Cooler"!** Vitally needed increases in power transformer capacities can now be obtained quickly with a new system of forced-oil cooling that saves 25% in critical war materials on new transformers.

This new Allis-Chalmers cooling unit, called the "Electro-Cooler," will step up capacity of transformers already in service by about 20 to 60%.

This new unit makes the forced-oil system of cooling transformers highly practical because it is built compact, factory-assembled and factory-tested at high pressure to minimize the possibility of future maintenance. If transformer has radiator valves, the unit can be removed without draining transformer oil and parts can be replaced without delay in transformer operation.



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1906 to 1908 it did considerable hydro-electric development work in and around Wausau, Wisconsin.

In 1913 Heskett and his associates purchased the Chisholm Electric Company at Chisholm, Minnesota, which is located in the middle of the great Mesabi Iron Range in Northeastern Minnesota. With this as a starting point, he began the development of the Minnesota Utilities Company and extended its electric transmission lines east and west across the Range. He built a hydro-electric plant at Winton, Minnesota, to furnish electric service to the iron mining industry and communities throughout the Iron Range. During the next ten-year development period, Heskett saw the complete fulfillment of his plan to supply the mining industry with electric power service, with the resultant abandonment of individual steam-operated power plants at each mine. In 1923, the Minnesota Utilities Company was acquired by the American Power & Light Co. and was merged with other electric utilities operating in the "Head-of-the-Lakes" District, to form the Minnesota Power and Light Company.

Later, he traveled extensively in this country and in Europe, studying various phases of the electric power industry, having in mind the formation of a new company. In 1924, when the purchase of the electric utility at Glendive, Montana, was completed, he assisted in forming the Montana-Dakota Utilities Company. The territory comprising Eastern Montana and Western North Dakota was developed by this enterprise. The cities and towns in this area had been served, generally, by individual electric power plants, giving more or less intermittent service. Efficient and modern electric service was provided by establishing a number of large central power plants serving the many towns and cities in that area with high voltage transmission lines. Four central electric power plants were built; service is now provided to more than ninety-seven towns and cities in this territory. To provide a reliable source of cheap fuel for the power plants, the development of the Baker, Montana, natural gas field was started. Gradually more than 1,000 miles of gas transmission pipelines were built to serve more than sixty towns and cities with natural gas service. Lines now extend from Baker north to Miles City and Glendive, Montana, and to Williston, North Dakota; east as far as Bismarck, North Dakota; and south to all the cities in the Black Hills area of South Dakota. Later, the Bowdoin gas field, the largest in Montana, as well as other smaller fields in that state and in Wyoming, were developed. The successful development of this enterprise into a $30,000,000 corporation is credited to the personal effort, vision and enterprise of Heskett.

In 1907, he married Miss Mary Glynn of Green Bay, Wisconsin. The Hesketts have four children, two boys and two girls. One son is a graduate of Harvard University, while the other is a graduate of Massachusetts Institute of Technology. Both are serving in the United States Navy. Heskett is a member of the Minneapolis Club, the Esquagama Club, A. F. and A. M., and is a Shriner. He has always taken an active interest in public affairs, frequently serving as president of the Chamber of Commerce and other public bodies. He has been a director of several local banks and other business organizations. In 1943, he was elected to the board of the Masonite Corporation of Chicago.

Heskett has been so busy creating and developing the various utility enterprises he has been identified with that he has had little time to give to any particular hobby. He plays a limited amount of golf, and enjoys the theatre. He devotes practically all of his spare time to his family and his home life. In business, he is extremely forceful, yet he is most friendly and considerate of his associates. He is a most agreeable companion and host.

The Hesketts reside at 4301 East Lake Harriett Boulevard, Minneapolis, Minnesota.

## ALUMNI SECRETARY

Arthur E. Wright, A.S. I'41, is on leave from the Alumni office after having served as executive secretary since the association was formed. He has received a commission as ensign in the United States Naval Reserve and has reported for duty. Jeannette MacLuckie, H.E. I'41, has been selected to be the acting executive secretary. After her graduation she was employed by the Commonwealth Edison Company and came to the Alumni office in December of 1943.

### 1898

Konsberg, Alvin V., Ac. A., who lives at 412 Lake Street, Evanston, Illinois, has his business office at 8 South Dearborn Street, Chicago.

### 1903

Wilhoit, Frederic S., E.E. A., retired August 1, 1943, after forty-one years of service with Cutler-Hammer, Inc., of Milwaukee, Wisconsin. His new residence address is 11725 Addison Street, North Hollywood, California.

### 1904

Prescott, Orson R., M.E. A., is a mechanical engineer for the City of Chicago. He resides at 5910 Rice Street, Chicago, Illinois, with his wife Olga and son Robert.

### 1905

Marie Blanke became the sponsor for the Kappa Phi Delta Sorority at Lewis Institute, February 12, 1944. A luncheon was given in honor of her retirement from active teaching by the members of the Alumnae Chapter at the Bismarck Hotel.

### 1907

Wachs, Theodore, M.E. A., whose former address was 145 Colonial Ridge Drive, Haddonfield, New Jersey, now is residing at 70 West Princeton Road, Cynwyd, Pennsylvania.

### 1910

Dabbert, George, Ac. L., has moved from 411 Cottage Hill Avenue, Elmhurst, Illinois, to Bradenton, Florida, in care of General Delivery.

### 1912

Ellis, Mrs. C. Howard (Sarah H. Porter) D.E. L., resigned her position as Assistant Director of Extension, Iowa State College, Ames, Iowa, on September 1, 1943, to accept the position of Director of Farm Home Service with Southern States Co-operative, Richmond 13, Virginia. She resides at 24 West Lock Lane, Richmond, Virginia.

### 1913

Stewart, John L., C.E. A., who lives at 2136 Lincoln Park, West, Chicago, Illinois, is an architectural representative for the Celotex Corporation, 120 South LaSalle Street, Chicago, Illinois.

### 1915

Pathman, Felix S., C.E. A., is a teacher for the Board of Education in Chicago. His residence address is 3457 West Monroe Street, Chicago, Illinois.

### 1916

Armacost, Wilbur H., M.E. A., is vice-president of Combustion Engineering Company, Incorporated, 200 Madison Avenue, New York, New York. Mr. Armacost also supervises the design of industrial superheaters and economizers, as well as forced-circulation boilers, and is responsible for the chemical recovery units and VU-type steam generators.

Bower, Floyd T., F.P.E. A., is employed as a fire insurance special agent by the Aetna Insurance Company, 218½ Park Place, Petoskey, Michigan. His residence address is 112 Michigan.

LeVally, John R., M.E. A., wrote this very interesting letter with information concerning his son John R. LeVally, Jr., M.E. I '43:

Gentlemen:

My son, John R. LeValley, Jr., Class of '43, who was called to active service in the Naval Reserve in January 1941, as a seaman, has worked up through the ranks and was commissioned as ensign last May, is now an officer on one of the new destroyer escort ships in North African waters.

He has served in several theatres and on several ships, working up through

# REAL ENOUGH... for Basic Training!



NEW telephone operators generally take basic training at idle switchboard positions. But today's switchboards are crowded with war calls.

Meeting the challenge of wartime shortages, full-scale photographs of switchboard panels are helping speed the training of more than 125,000 new operators needed this year in the Bell Telephone System.

Actual cords, keys, dials, and calculagraphs for timing calls, give realistic practice, quickly training operators to handle real calls.

Every resource of the Bell System is serving the Nation, maintaining communications now so vital in war — so important in the better days ahead.

**BELL TELEPHONE SYSTEM**



*War calls keep Long Distance lines busy... That's why your call may be delayed.*

the torpedoman ratings, and I thought you might be interested in the fact that, although he was called out in the middle of his course, it was still possible for him to work up to a commission.

Yours very truly,
JOHN R. LEVALLY '16.

## 1917

Holiday Greetings were received from Major LLOYD E. MELLOR, A. A., who is stationed at Stewart Field, U. S. Military Academy, Newburgh, New York.

## 1920

BERNSTEIN, SAMUEL M., Ac. L., is now living at 2657 Farwell Avenue, Chicago, Illinois.

## 1921

MRS. R. J. Grant, 7728 Merrill Avenue, Chicago, writes that her husband, RICHARD J. GRANT, E.E. A., of the U. S. N. R., 77th Naval Construction Battalion, is now serving overseas. In civilian life, Grant was a supervising engineer of the Engineering Department, Commonwealth Edison Company, Chicago.

## 1923

BOLLER, GEORGE, A.S. L., wrote the following letter on December 19, 1943.

Gentlemen:

I have just received your October issue. Many thanks. I have read it with great interest. I would like to continue getting it and to that end I am sending you a check for one dollar and fifty cents (there's no dollar sign, only a L sign, on this English typewriter, for I am in England and have been all year) in a separate envelope. My correct address is:

Major George Boller 0-916648
Hq. VIII Fighter Command
APO 637, c/o Postmaster
New York, New York

It has not yet been my good fortune to run into any of our fellow alumni—nor, what would be my exceeding good fortune, any alumnae—over here on this isle, but if I do we'll have an alumni meeting here.

Cordially yours,
GEORGE BOLLER.

SCHULZE, MARTIN C., M.E. A., who lives at 320 South Michigan Avenue, Villa Park, Illinois, is employed as a heating engineer for the Western United Gas and Electric Company, Downers Grove, Illinois.

## 1924

ACKERMANN, SOPHIE, A.S. L., is a teacher at Hirsch High School. Her residence address is 8243 Langley Avenue, Chicago.

## 1925

BEDI, BABA HARKISHAN SINGH, E.E. L., recently wrote the following letter to Dean Rogers from Court Hill, Simla, India:

My dear Dean Rogers:

I am enclosing herewith a copy of a letter addressed to the secretary, American Institute of Electrical Engineers for favour of your perusal. You will very kindly notice that I have applied for membership in the Institute and have given you as reference.

I am sure Lewis people are all as gay and as happy as they have always been. I feel confident that they are serving Uncle Sam and the allied cause in this world-wide struggle and are giving a very good account of themselves at home as well as abroad.

I wish to know the addresses of some of my classmates and Lewis graduates of 1925 who are serving abroad and especially who may have come to India with American forces. I would enjoy meeting them and renewing old friendships. If you will let me have a list, I shall get in touch with them.

With profoundest respects and good wishes

Very sincerely yours,
H. S. BEDI.

EGE, WILLIAM W., E.E. L., has moved to 413 Morrison Drive, Mt. Lebanon, Pittsburgh 16, Pennsylvania. He is employed as general manager of sales by Copperweld Steel Company, Glassport, Pennsylvania.

## 1926

According to a recent news release, RALPH G. RAYMOND, E.E. L., manager of electricity sales, Commonwealth Edison Company, 72 West Adams Street, Chicago, Illinois, was re-elected president of the Board of Directors of the Chicago Lighting Institute, and CARL W. ZERSEN, E.E. L 28, was elected assistant secretary-treasurer.

## 1927

OSGOOD, RICHARD G., F.P.E. A., is fire secretary for the North America Companies, 1600 Archer Street, Philadelphia 1, Pennsylvania.

SPITZER, MRS. AMY B., A.S. L., has moved to 434 North Oak Park Avenue, Oak Park, Illinois.

## 1929

SCHOFIELD, BERNARD R., E.E. A., is a radio engineer for the Aladdin Radio Industries, 466 West Superior Street, Chicago, Illinois. His new home address is 123rd and 90th Street, Palos Park, Illinois.

STELLAR, RAYMOND E., C.E. A., is a civil engineer with the U. S. Army Corps of Engineers, 21st and Virginia Avenues, N.W., Washington, D. C. He resides at 4120 Arkansas Avenue, N.W., Washington, D. C.

## 1930

SCHRAGE, ALFRED T., F.P.E. A., is employed by the Western Sprinkled Risk Association, 175 West Jackson Boulevard, Chicago, Illinois, as a fire protection engineer. He lives at 1928 East 90th Street, Cleveland, Ohio.

## 1931

BLAHNA, CHARLES, E.E. A., who lives at 3351 North Rutherford Avenue, Chicago, is a radio engineer for the Galvin Manufacturing Corporation, 4545 West Augusta Boulevard, Chicago, Illinois.

## 1932

NORDELL, WALTER E., F.P.E. A., special agent in Iowa for Crum & Forster, reported December 12, 1943, at Tucson, Arizona, for induction into the Navy. He holds a reserve commission as lieutenant and will enter fire fighting work. He will go to New York City for two months special training.

OTTO, Corp. SAMUEL L., M.E. A., reports from somewhere in Italy that he is still with an Ordnance Motor Vehicle Assembly Company.

## 1933

DAVIES, WILFRED W., A.A., has been a research engineer for United Air Lines, 5959 South Cicero Avenue, Chicago, since 1932. He resides at 3925 Grove Avenue, Western Springs, Illinois.

VANDERPOORTEN, STEPHEN A., F.P.E. A., has been senior inspector for the Internal Security Branch of the Army Air Forces, Central Procurement District, since March, 1942. He lives at 720 West Euclid, Detroit, Michigan.

## 1934

BROCKMANN, MEARL W., F.P.E. A., recently accepted a position as engineer for the National Fire Group, after serving nine years with the Indiana Inspection Bureau. His home address is 543 East 87th Place, Chicago.

## 1935

BENTON, WILLIAM T., E.E. L., has recently moved from 1214 South Maple, to 709 Keith Avenue, Waukegan, Illinois.

ROBERTS, JOHN L., F.P.E. A., is a special agent for the F.B.I., 1300 Biscayne Building, Miami, Florida, and resides at 625 S. W. 23rd Avenue, Miami.

## 1937

BURACK, Lt. BENJAMIN, A.S. L., writes from Headquarters Special Training Unit, Fort Jackson, South Carolina.

Reading the latest issue (December) of the *Technometer* has been fun, especially all the news about the Thursday luncheons.

By the way, I'd like to give you my new address—it's as listed on the envelope. I'm the personnel consultant of this unit, which is a school for educating illiterates. The soldiers, who come here directly from reception centers, are newly inducted into the Army and are given a twelve-weeks course in the simple fundamentals of reading, arithmetic and writing. It is hard to describe the feeling they have when, after a week's schooling, some write their names for the first time.

Sincerely,
Lt. BENJAMIN BURACK
H.Q. Spec. Tng. Br.
Fort Jackson, South Carolina

IKENN, IAN R., C.E. A., recently wrote: Am now employed at Clinton Engineering Works, Oak Ridge, Tennessee. Met William Chelgren, M.E. A'38, on this job. Still expect to find more Armour men here. Am living at 2721 E. Magnolia, Knoxville, Tennessee.

SCHREIBER, ALEXANDER P., Ch.E. A., is now an ensign in the U. S. Naval Reserve. His present address is 1429 West 21st Street, Washington, D. C. His home address is 8257 Ellis Avenue, Chicago, Illinois.

WOLFF, CHARLES E., A.S. L., is with the United States Army. He writes:

Well, it's been four months since I've landed here in North Africa—after a "peaceful" voyage across turbulent waters—but it certainly feels as if I've been overseas a whole year. Can you explain it? I can't.

Since landing on these shores, our outfit which is a quartermaster service unit, has been scattered thru-out the whole theatre of operations.

After listening to the first-hand accounts of the various battles that took place around this part of the world . . . Hill 609; Tebourba tank and artillery battles; Mateur & Bizerte; the Battle for the Tunis Highway . . . and then being able to travel over the very ground and look at the aftermath where these raging battles were fought, really gives a fellow a slant on what took place that he certainly will long remember.

You know, most people think North Africa is a land of burning sand—where it's scorching hot all day and night long. In fact, I did too, until I lived here for a short while. Well, frankly, I think North Africa can be called a cold land under a hot sun. After living in Algeria and now in

KEEPING UP WITH
*Electricity*

**1000 REVOLUTIONS PER SECOND!** That's the speed of newest Westinghouse motor, producing a tool surface speed of 7,000 feet per minute. This 4 horsepower induction motor has a rotor only 2 inches long, diameter 1¾ inches. Westinghouse engineers are now developing a motor to go *twice as fast.*

**B'R'R'R'R'R . . .** A polar bear would be right at home at 20° below zero in the Westinghouse "igloo" at East Pittsburgh. This cold chamber is 1500 times as large as the average electric home refrigerator. Here, Westinghouse engineers test ice-coated circuit breakers and other electrical switching equipment, to guarantee operation under worst winter conditions.

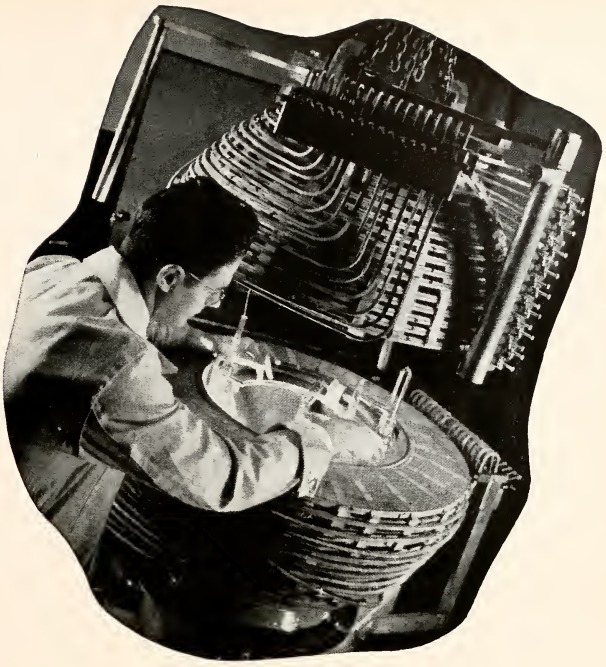
**HIGH LIFE IS HARD** on carbon generator brushes in high-flying bombers. They used to wear down to the pigtails in an hour or two, at 30,000 feet. Now Westinghouse engineers have developed a chemical treatment that keeps the brush face lubricated at substratosphere heights. Result: *fifty-fold* increase in brush life . . . enough for a dozen raids over Berlin.

**EVER SEE A MILLIONTH** of an inch? Probably you never will—but the Electrigage can *feel* as little as twelve millionths. Developed by Westinghouse and Sheffield Corporation, it can measure with a precision equal to finding an error of three-quarters of an inch in a mile. Infinitesimal movement of gauging stylus induces a tiny current, which is amplified 10,000 times.

**AIR IS HEAVY STUFF** when you start pushing it around at 400 miles an hour. That's why U. S. Army needed a 40,000 horsepower electric motor to create a man-made hurricane, for testing airplanes in Wright Field wind tunnel. It is the world's largest wound-rotor induction motor, designed and built by Westinghouse engineers.

. . .

The above items are condensed excerpts from articles in the WESTINGHOUSE ENGINEER, a bi-monthly engineering review. Regular subscription price—$2.00 a year. *Special price to students—50¢.*



# Chemical analyses—*right now!*

Above is the laboratory model of the Westinghouse mass spectrometer, which sorts out dissimilar molecules according to their mass, and does it almost as fast as you can snap your fingers.

The mass spectrometer provides a new way to get the quick, accurate analyses that are needed to maintain precise process control. Take the synthetic rubber industry, for example. Formerly, five men took as long as three days to complete necessary chemical tests in the processing of artificial rubber—which meant that the results were often too late to be useful.

*The new electronic "chemist," the Westinghouse mass spectrometer, now makes these tests in about 15 minutes.*

For leadership in the electrical solution of industry's problems, look to Westinghouse. *Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pennsylvania.*

***Tune in John Charles Thomas, NBC, Sundays, 2:30 p.m., E.W.T.***

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

Tunisia, I've found that the nights are cool in winter and summer days are hot. Actually, a soldier must be prepared for extremes in temperature. . . Here it is Xmas time—and the temperature this afternoon is hovering around 65 degrees. I wonder how cold it is in Chicago.

Sanitation is lacking in many areas, and now that the Germans have given North Africa back to the Arabs(?), sanitation is even worse. With reasonable care on the part of our own men there has been no decided increase in illness in our own organization. Special attention has to be paid to drinking water, raw fruits and vegetables, amebic dysentery and personal hygiene. Let's see, since I've been in my present location, I've had an opportunity to visit Tunis, Bizerte, Tebourba and Carthage. Of these towns, I like Tunis best. Barring some bombing that was done, this town of Tunis boasts of fine French architecture, a busy and rich metropolis and . . . plenty of French mademoiselles . . . Oui, Oui.

Since coming overseas, my single outstanding incident was meeting my brother Jerry for the first time in over two years. Imagine that! It took an ocean voyage, nearly 4000 miles from our home to bring us together again.

Well, it's time for me to sign off. . .

Hope that I may hear from you soon.

Yours for a quick victory,

CHARLES E. WOLFF

Warrant Officer (J.G.)

## 1939

GRIESBACH, BERT H., M.E. A., is an assistant superintendent for Sciaky Brothers, 4915 West 67th Street, Chicago. He lives at 5931 South Kilbourn.

NEUBAUER, FRED W., C.E. A., is a lieutenant in the United States Army Air Force. His home address is 6224 North Artesian Avenue, Chicago, Illinois.

SHIDELER, DAVID, S. A., is a meteorologist at the weather bureau of the Chicago Airport. He resides at 530 North Pine Avenue, Chicago.

## 1940

JONES, CHARLES F., M.E. A., is a first lieutenant in the United States Army Air Force. His wife, Anna, resides at Westville, N.S., Canada. He entered the Army in March, 1941. As navigator and bombardier, he was trained by the RCAF in Canada and by the RAF in the British Isles. He flew on 138 bombing, torpedo-bombing, and mine-laying missions, convoy and anti-submarine patrols. He shot down one enemy aircraft, was credited with two probables and damaged three others. He was shot down into the sea three times. He was awarded the D.F.C., the Air Medal four times, the British D.F.C. and the R.A.F. Cross. He is the son of Mr. and Mrs. Charles W. Jones of 843 East 80th Street, Chicago, Illinois.

MAXWELL, JR., ROBERT B., F.P.E. A., has been appointed special agent in Chicago for the New York Underwriters, 175 West Jackson Boulevard. Mr. Maxwell was with the Missouri Inspection Bureau until 1942, when he went with the Plant Protection Branch of Internal Security, District No. 3.

## 1941

LARSON, RICHARD A., F.P.E. I., is an ensign in the United States Naval Reserve. His home address is 1533 West 83rd Street, Chicago.

MATTHEWS, GEORGE J., E.E. I., sent the following announcement to the Alumni office:

May I inform you at this time of my impending marriage on January 2nd to Miss Ellen Putnam of Chicago. The wedding will undoubtedly take place here in DeLand, Florida. Will write more later.

Private GEORGE J. MATTHEWS' address is S.C.V. 3411 Star, John B. Stetson University, DeLand, Florida.

RANSOM, FRANCIS A., M.S. I., is a production engineer for Lockheed Aircraft Corporation, Burbank, California. He lives at 412 South Detroit, Los Angeles, California. Ransom was an assistant in the mechanical engineering department, teaching mechanical drawing, at Armour Institute during the year 1940-1941.

## 1942

BUERCKHOLTZ, PAUL H., M.E. I., now a lieutenant (j.g.) in the United States Naval Reserve, is serving his country somewhere in the South Pacific.

PLEVA, M. F., C.E. I., a lieutenant (j.g.) in the United States Navy, has been in the service since May, 1942. His residence address is 2410 South Harding Avenue, Chicago, Illinois.

SIEMEN, LT. SHERMAN PAUL, M.E. I., is an aviation engineer in the United States Army Air Corps. His mailing address is APO 604, c/o Postmaster, Miami, Florida.

STEVENS, HOWARD R., C.E. I., son of Prof. and Mrs. Roe L. Stevens, 2318 Hartrey Street, is at Miami Beach, Florida, for basic training in the Army Air Forces, following an announcement made by the army air cadet examining board that he had made the highest score in his mental tests ever recorded by enlistees taking the examination.

A/C Stevens made a score of 346, when he took the exam after enlisting Nov. 16. Previous high score, according to examining board officials, was 333. Highest attainable score for the exam is 390.

Before his enlistment A/C Stevens, who is twenty-five years old, was employed by the Chicago, Milwaukee and St. Paul railroad as a civil engineer. His father is professor of civil engineering at the Institute, temporarily absent on account of illness.

## 1943

KEIGHER, DONALD JAMES, F.P.E. I., an ensign in the United States Naval Reserve writes:

My Navy experience has covered a wide scope. Aboard this cruiser-like destroyer I'm assistant engineer, also in charge of a repair party as a battle station. We've had both Atlantic and Pacific duty. Although there is a real war out here, I prefer this to the rough Atlantic. The blue placid waters of the Pacific makes sailing a joy, except ours is never for fun.

About every six months the ENGINEER and ALUMNUS reaches me. Only first-class mail gets out here to the islands.

Destroyer duty is the best ever. Every officer must learn three or four jobs. As a result you become well-rounded officers in record time. Versatility is the key to good "tin-can" operations.

As always,

DON KEIGHER.

KIRK, ROBERT S., Ch.E. I., is a research assistant at the University of Wisconsin. His residence address is 2261 Regent Street, Madison 5, Wisconsin.

PHILLEY, FLORA A., A.S. I., a graduate of the October 1943 class, writes:

Have taught continuously in the public schools, except 1927, when I spent a year at Lewis. Then resumed teaching at Gary, Indiana, where I am at present. This is my fortieth year in the public schools. I feel that I have had the privilege of attending two of the greatest educational institutions in America —Valparaiso University of the old days —and Lewis. It was an inspiration this summer to study again with Dr. Matthews at I.I.T. I shall be most proud of my diploma and grateful to the institution that made it possible for me to finish my work at this late date.

In the ten years left to me (by Indiana law) I shall strive to do my school credit.

Very truly yours,

FLORA A. PHILLEY.

RASMUSSEN, ROBERT W., Ch.E. I., received his Master of Science degree in Chemical Engineering from Illinois Institute of Technology in July, 1943, and is now employed as an instructor at the University of Texas. He resides at 607 Rathervue Place, Austin, Texas.

REARDON, MICHAEL J., M.E. I., is employed as a research engineer by Dodge Aircraft Plant, Chicago, and resides at 8940 S. Racine Avenue, Chicago 20.

ROBBINS, VERNON E., M.E. I., is employed by Foote Brothers Gear and Machine Corporation, 5225 S. Western Avenue, Chicago, as a project engineer in the research and development department. His residence address is 2913 N. Mulligan Avenue, Chicago.

## 1944

FERGUSON, JAMES E., E.E. I., is stationed at the University of South Dakota, Vermilion, South Dakota, with the Army Specialized Training Unit.

LEAVITT, EDWARD H., M.E. I., was inducted into the Army February 12, 1943, and received his basic training with tank destroyers at Camp Hood, Texas. His present address is:

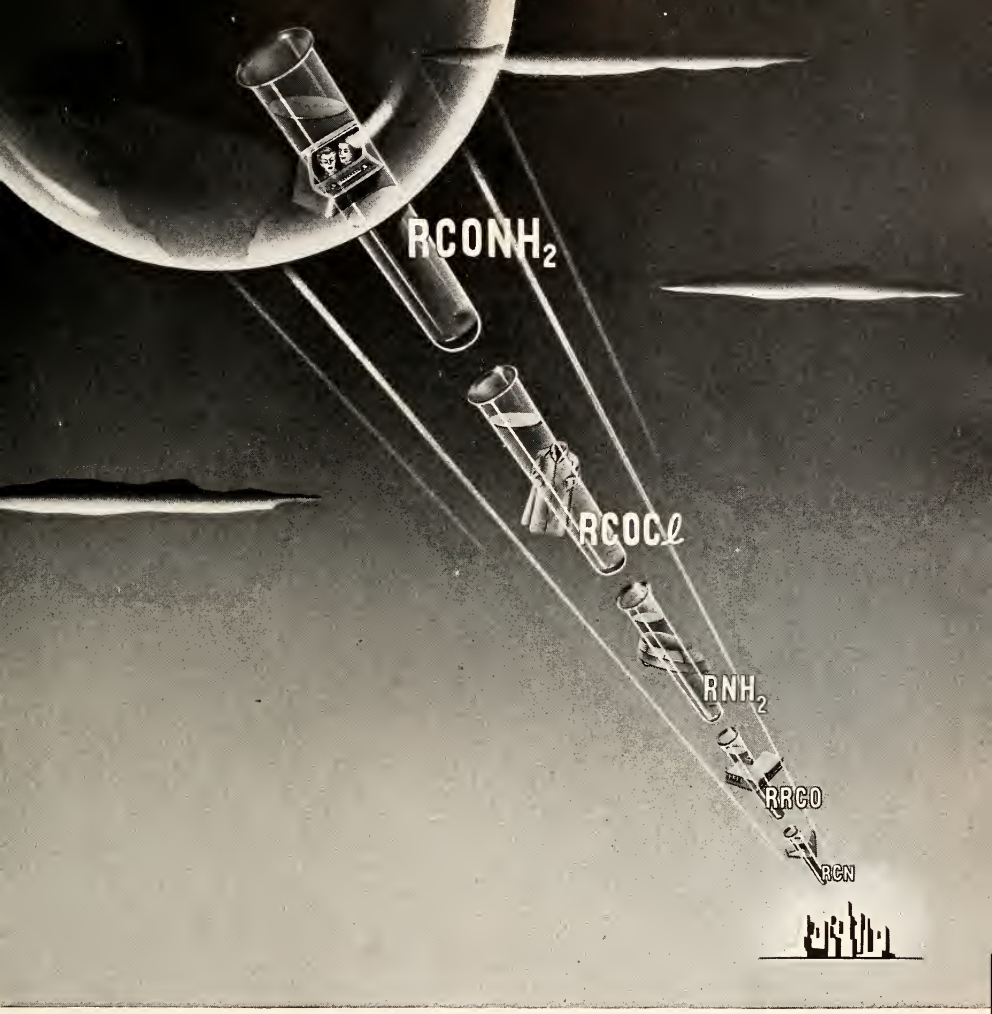
Pvt. Edw. H. Leavitt 36 614 638
Unassigned APO 7113
c/o Postmaster, New York

MILLER, ROBERT J., M.E. I., son of Mr. and Mrs. Joseph E. Miller of 3024 Gustave, Franklin Park, Illinois, graduated December 31, 1943 from the Naval Air Training Center, Corpus Christi, Texas, and was commissioned an ensign in the United States Naval Reserve.

MOORE, WARREN F., M.E. I., is an aviation cadet stationed in Corpus Christi, Texas, with the Cadet Regiment, Class 10A, United States Naval Air Training Corps. The following letter was sent by him:

I've been here since the first week in October, and am well acquainted with the city and its huge air station close by. Corpus Christi is said to be the fastest growing city in Texas and these figures seem to prove it. Before we entered the war, the city's population was approximately 30,000 and today they say it's over 100,000. Private and industrial housing and the expansion of commercial and industrial interests have spread the city out tremendously. The Navy has contributed much to the advancement of the city while constructing breakwaters, piers, and a beautiful drive extending for several miles along the water-front. All of this work was done by that new branch of the Navy known as the "Seabees." They are gone now but I wish I could have seen them in action—they certainly have done a marvelous job.

The city is built on the inland-edge of Corpus Christi Bay, which in turn is protected by a long narrow island which




## SHORTEST DISTANCE TO TOMORROW'S BETTER LIVING . . . "CD" CHEMICALS

These comprise really high molecular weight Amines . . . Nitriles . . . Ketones . . . Amides . . . Acid Chlorides . . . All in regular daily, large-scale commercial production . . . Normal alkyl chains ranging in length from 6 to 18 carbon atoms in the saturated series . . . 9-octadecene and 9-12-octadecadiene in the unsaturated series.

Fields of utility are still largely unexplored but are expanding rapidly. Your request for samples should be as specific as possible to avoid duplication of effort.

### PERTINENT DATA

**AMINES**—organic ammonias—primaries—secondaries—tertiaries—M. W. 101 to 773—B. P. 133° C. to >350° C. @ 760 m.—M. P. 19 to 65° C.—very reactive.

**NITRILES**—Non-toxic, organic cyanides—M. W. 97 to 265—M. P. −79° C. to 41° C.—B. P. 165° C. to 367° C. @ 760 mm.—exceptional thermal stability.

**AMIDES**—stable below 170° C. in the absence of catalyst—M. W. 115 to 704—M. P. 75 to 160° C.—insoluble in aqueous solutions—fairly reactive chemically.

**KETONES**—symmetrical aliphatic and unsymmetrical aliphatic—exceptionally heat stable—M. W. 142 to 507—M. P.—8° C. to 86.7° C.—B.P. 194 to >350° C. @ 760 mm.—chemically very inert.

**ACID CHLORIDES**—unstable in the presence of moisture—M. W. 135 to 303—B. P. 153° C. @ 760 mm. to 215° C. @ 15 mm.—M. P.—87° C. to 23° C.—very reactive.




**ARMOUR CHEMICAL DIVISION**

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extends for miles and miles along the coast here. The depth of the water in the bay and this island makes it impossible for oceanic trade (but they say you can catch all kinds of fish here). The extensive concrete breakwaters and banks along the shore are protection against the invincible hurricanes which threaten this zone, and there is much to be protected with new buildings sprouting up. There have been extreme advances in the petroleum processing industry close by, and this, more than anything else, will disprove the theory that Corpus Christi will become a ghost town after the war. The Naval Air Station will most certainly remain, as it is fully developed as a training station, and in addition it will serve as an air terminal of first rate for commercial aviation after the war. In addition to land-plane facilities, the oceanic planes will find this an ideal stopping off place. Those industrial workers who are now living in those temporary hastily constructed homes and trailer camps will find new accommodations after the war in homes vacated by officers and enlisted men and their families, and things will be nicely equalized.

The Naval Air Center, as it is called, is about fifteen miles from the city and is almost a city in itself. Surrounding the main station, which is indescribably huge in itself, are auxiliary fields comparable to Glenview or any field located at a moderate sized city. These integral fields are anywhere up to—(many) miles away from the central location of NATC and each one has its own part in our training, its own commanding officer, and military organization. The whole organization both here and at Pensacola, Florida, is under the experienced pioneer in naval aviation, Admiral Mason. He and his staff are situated here at Corpus Christi now, so we are under close observation, you see.

I have been selected for fighter-plane training, and was recently sent to this auxiliary field, called Waldron Field, to start my training as such.

Sincerely yours,
WARREN F. MOORE.

SCHULTZ JR., GEORGE F., M.E. I., writes that copies of the *Technometer* have been trailing him from camp to camp, but now he is at a station where his address will be permanent for some time. His new address is:

Pvt. George F. Schultz, Jr., 16170658
Co. B 2517th S.U. (A.S.T.) Sect. 208
The Catholic University of America
Michigan Avenue, N.E.—Room 300
Washington, 17, D. C.

## 1945

ABRAMS, JOSEPH L., Ch. E. I., Co. A, 588th Training Battalion, Drew Field, Tampa, Florida, writes the following:

Above is my address. Mail all the alumni publications to it. Thanks for keeping me informed on I.I.T. Carry on the good work.

An appreciative alumnus,
CPL. J. ABRAMS.

CARLSEN, ELMER P., C.E. I., was graduated January 5, 1944, from the Naval Air Training Center, Corpus Christi, Texas, and was commissioned an ensign in the United States Naval Reserve. His residence address is 7229 S. Wabash Avenue, Chicago, Illinois.

LONERGAN JR., VINCENT J., M.E. I., is now serving in the United States Army in North Africa. His residence address is 2433 W. Fargo Avenue, Chicago, Illinois.

RAFF, ALLAN, Ch.E. I., now in the United States Army, is attending college with the Army Specialized Training Program in Basic Engineering II. His residence address is 8049 Oglesby Avenue, Chicago.

REED, JOHN F., S. I., is a cadet studying meteorology with the Army Air Corps. His home address is 836 W. Garfield Boulevard, Chicago.

## 1946

We were very pleased to receive the following letter and picture from ECKHARDT W. KAYSER, A.S. I.:

Dear Mr. Wright and Alumni Office:

I hope this letter reaches you in time. I read that you are going into the service. Well, I wish you all the luck there is. We are getting along pretty well here in Louisville. It gets somewhat monotonous here, but I have the prospect of getting into midshipmen's school soon (this summer) (or is it so soon?) so I am not complaining. I wanted to visit you during my Christmas leave but never had the time to get downtown.

We had Lord Halifax visit our school. He got an honorary degree. Naturally we put on a military show for him and in the evening we marched to an auditorium where he gave a speech. That was the only break in our routine.

Our gym classes have improved quite a bit now. We lost our old chiefs so now we have some new athletic specialists who know how to run the classes.

I am enclosing a long promised picture of me. It was taken last fall right after our Saturday marching. I hope that it satisfies the requirements of the office. Well, I have to hurry away now so I'll wish you all a happy and fruitful new year. Next time I get home I'll see how many are left in the old place.

Oh yes—RALPH GRAZIANO, A.S. I '46 and IRV RAPPAPORT, A.S. I '46 and the other I.I.T. boys here send their greetings too.

Yours in common effort,
ECKHARDT KAYSER

NEIS, MATTHEW N., M.E. I., has been a member of the United States Coast Guard since January 24, 1943. His address is, U. S. Coast Guard Barracks, 14 New Chambers Street, New York, New York.

RIDGWAY, RAYMOND A., Ch.E. I., is now attending the University of North Dakota as a member of the A.S.T.P. Mail will reach him at the following address: A.S.T.P., University of North Dakota, SU 3713, Grand Forks, North Dakota.

ROESSLER, WILLIAM A., E.E. I., writes that he is in meteorology, Army Air Force at the University of Chicago since January, 1943, and expects to finish electrical engineering at I.I.T. after the War.

His residence address is 8247 South Ada Street, Chicago, Illinois.

SEEMON, BERNARD, M.E. I., is taking an engineering course at the Virginia Polytechnic Institute, Box 75, Blacksburg, Virginia, with the A.S.T.U.

STEINBERG, P.F.C. AARON, M.E. I., has been in the armed forces since March 12, 1943. He is stationed at the Naval Air Station, T.S. 8-A, at Pensacola, Florida.

TOMEK, ROBERT E., Ch.E. I., was promoted to the rank of sergeant in the Marine air detachment at Corpus Christi, Texas. Sergeant Tomek, son of Mr. and Mrs. J. Tomek, 4437 S. Trumbull Avenue, has been in the Marine Corps for over a year, and took previous training in radar at the University of Utah. His mailing address is:

Sgt. Robert E. Tomek, M.A.D.
Sqdn. 52, Sec. 15, Ward Island,
Corpus Christi, Texas

TRAINA, ROBERT D., M.E. I., enlisted with the Navy on February 5, 1943. Graduated November 5, 1943, as an aviation machinist from the Navy Pier, Chicago, Illinois.

TWOREK, CPL. ROMAN R., C.E. I., left I.I.T. on March 26, 1943, and at the present time is serving the United States ground forces as air mechanic.

WINSBERG, ALLAN E., M.E. I., is at present taking a pre-meteorology course at Kenyon College, Gambier, Ohio. His home address is 1840 E. 72nd Street, Chicago, Illinois.

YOUNG, PVT. ALLAN P., Ch.E. I., has completed the Basic I course in the A.S.T.U. and at present is taking the Basic II course at the Virginia Polytechnic Institute, Blacksburg, Virginia. His address is Co. A, 3301st S.U., A.S.T.U., Box 1371, Blacksburg, Virginia.

# ENGAGEMENTS

## 1929

The engagement of Ensign Edith Roberta Andruss of the Waves, daughter of Mr. and Mrs. Robert A. Andruss of Pelham Manor, New York, to RAYMOND FRANK STELLAR, C.E. A., son of the late Mr. and Mrs. Frank Stellar of Chicago, has been announced. Mr. Stellar is with the office of Chief Engineer of the United States Army, Washington, D. C.

## 1941

Mr. and Mrs. Michel J. Lynch of 201 Speedwell Avenue, Morristown, New Jersey, have announced the engagement of their daughter, Julia Marie to RAYMOND W. KOSLEY, M.E. I., son of Mrs. Walter Kosley of Chicago, Illinois.

Miss Lynch and Mr. Kosley are both employed by the Bell Telephone Laboratories in Whippany, New Jersey.

## 1942

Mrs. Gertrude Sharkansky announces the engagement of her daughter, Reva, to GERALD GOLDEN, Ch.E. I., son of Mr. and Mrs. Abe Golden.

## 1943

Mr. and Mrs. Harold Romig of Allentown, Pennsylvania, have announced the engagement of their daughter Louise to Ensign DONALD F. TRUE, M.E. I., son of Mr. and Mrs. Edwin S. True of Oak Park, Illinois. Ensign True is stationed at Treasure Island, California.

# MARRIAGES

## 1943

MERLE W. DARGEL, M. E. I., was married to Adeline Peterson on December 11, 1943.

Mrs. Eva Mayer of South Shore, announces the recent marriage of her daughter Ruthe to SYLVAN SALK, A.S. I., son of Mr. and Mrs. Sam Salk.

The promise of plastics, in the after-war years, holds so much for manufacturers and consumers alike that perhaps we should learn a little more about the nature of these new materials.

Of prime significance, chemically made plastics are unlike any structural material we have had to work with in the past.

Plastics are the product of chemistry. They are one of the outstanding examples of the chemist's ability to produce—out of coal, petroleum, air, salt, and other basic elements —totally new substances.

Important to an understanding of plastics is that they differ widely in their property characteristics.

For example, some plastics are extremely tough and withstand rough usage. This is true of Ethocel—one of the Dow plastics. Other types are pliable. Some have almost optical qualities in their clarity. Others possess excellent electrical insulating value. Some withstand heat and others extreme cold.

Among Dow plastics possessing some of these properties to a high degree is Styron—a plastic especially valuable as an electrical insulator and having many other uses where lustrous beauty or resistance to acids and alkalis are factors of importance. Saran, on the other hand, is notable for its tensile strength and flexibility, which make it widely used for such products as tubing, woven fabrics and rope. Ethocel, in a special formula, is especially strong and tough at extremely low temperatures.



# JUST WHAT ARE "PLASTICS"?

The important point to remember is that the science of plastics is progressing rapidly. Already there exist many specialized plastics for specific applications. As our knowledge of both plastic compositions and the techniques for handling them increases, these new materials will undoubtedly become even more widely used than is now planned.

**Dow Plastics include**
***Styron, Saran, Saran Film, Ethocel and Ethocel Sheeting***

**THE DOW CHEMICAL COMPANY,** MIDLAND, MICHIGAN

New York Boston Philadelphia Washington Cleveland Detroit Chicago St. Louis Houston San Francisco Los Angeles Seattle

DOW
CHEMICALS PLASTICS MAGNESIUM
INDISPENSABLE TO INDUSTRY AND VICTORY

## MISSING IN ACTION

### 1945

JOHN BURDETT MCCORMICK, A.S. I., piloting a Liberator with the 8th Air Force, was reported missing in action following raid over Norway November 18, 1943.

## OBITUARIES

### 1926

HUSEBY, EDMOND A., ARCH., passed away on November 23, 1943. He resided at 842 N. Euclid Avenue, Oak Park, Illinois.

### 1937

FREEMAN, ROBERT K., F.P.E. A., was killed in action while fighting somewhere in the South Pacific.

### 1941

KULIEKE, CHARLES EDWARD, ARCH. I., who participated in the invasion of Sicily and moved up into Italy, died on December 11, 1943 while in a camp located in Italy. He has a younger brother, FREDERICK C. KULIEKE, JR., M.E. I., who is serving in the United States Navy.

## A. C. SYSTEMS

(From page 15)

engine-type generators, for low-speed induction motors, for synchronous converters as they then existed, and, prospectively, for long distance transmission of power (because of better voltage regulation stemming from the smaller reactance drop). On the other hand 60 cycles was much better suited to lighting, both arc and incandescent, and in reason adoptable for other than very low speed induction motors. Because of its more general advantages 25-cycle systems gradually gained ascendance over 60-cycle systems and for a time threatened to encompass most new installations other than those where lighting directly from the alternating-current system was involved.

But as improved designs of 60-cycle induction motors enabled the hitherto superior performance of 25-cycle machines to be combined with the more numerous speeds afforded by 60-cycle machines; as hunting, commutation, and other problems besetting 60-cycle synchronous converter operation were resolved; as gradual development of the turbo-generator made clear that the higher speeds afforded by 60 cycles offered attractive opportunities for improved designs; as the introduction of the regulating synchronous condenser aided in overcoming the voltage-regulation difficulties attending 60-cycle long distance transmission; and as yet other advances in 60-cycle apparatus were effected, the 60-cycle system came back rapidly.

By the end of the 'teens it was apparent that 60 cycles was in the fore. And since many years before three-phase systems had become standardized for *both* long-distance transmission (for which purpose its pre-eminence was never questioned) and distribution—the rapid development of three-phase high-voltage long-distance transmission lines in the late '90's and the first decades of this century had effected this; where necessary, earlier two-phase generating units and distribution systems were coupled to these lines by use of the two-phase to three-phase transformer connections invented by Scott and others—it was clear that 60-cycle three-phase networks were to be the networks of the future. This promise was shortly fulfilled as in the '20's—the heyday of private construction, the '30's—which witnessed the entry of the Federal government into the power field on a tremendous scale, and the present '40's, the country was filled with new 60-cycle, three-phase systems.

## WOOD

(From page 18)

burner is adjusted to produce a blue 10-in. flame (plus or minus ½ in.) at controlled temperature. The top of the burner is placed 1½ in. below the bottom of the crib and the flame is applied for 3 min. The loss in weight, and the duration of flame and glow after the exposing flame has been removed are the indices of the efficiency of the treatment. Untreated wood generally shows a loss in weight of 85 percent, while the glow and flaming varies 5 to 20 min. For treated wood the loss in weight depends on the time of glowing, which varies for different chemicals.

Although the reaction under fire exposure conditions in the tests described demonstrate reduction in combustibility, investigations have not yet been undertaken to develop information as to the relation between these small-scale test results and the fire resistance afforded by full-scale building structures such as walls, partitions, columns, and floors made with treated lumber, nor has information been developed as to the fire hazard or burning characteristics of large treated lumber surfaces existing in buildings.

The method for determining the *fire resistance* of structures has been standardized by the Standard Fire Test Specifications (ASA-A2.1-1942) in which building assemblies are subjected to standard fire conditions and are classified in terms of time, based on resistance afforded to collapse and transmission of flame and temperature.

No standard for *fire hazard* classification of materials used in building structures has yet been adopted, but during the past fifteen years Underwriters' Laboratories, Inc., has been developing such classification. Although the test method was developed for classification of building materials, its original basis was an attempt to compare the combustibility of treated and untreated lumber. For this classification, two kinds of commonly available building materials were chosen as representative of widely differing characteristic performances with respect to combustibility; these materials were cement asbestos board (known to have no combustible ingredients), taken as the low or zero point of a numerical scale, and select red-oak lumber for the 100 point.

The test consists of exposing one end of a test sample 25 ft. long and 20 in. wide, to an igniting fire of controlled severity. For this exposure, the gas fuel supply is constant. The draft is controlled so that fire will spread over the entire length of the red oak surface in approximately 5 min., 30 sec. Provision is made for observing the sample during the test and for recording temperatures, and rate of spread of flame; measurements are made of the density of smoke developed.

The data recorded during the test are separated into three divisions, representing the three properties considered as contributing to the fire hazard; namely—(1) contribution of fuel to an igniting fire, (2) rate of spread of fire, (3) density and/or toxicity of the smoke produced.

The contribution of fuel to an exposing fire is determined by the integration of the area below the curve developed by the temperatures recorded at the 24-ft. location.

The area under the curve for the combustible (red oak) material is affected by the Btu content of the gas of the igniting fire, plus the heat units released by the burning of the material, and this area, minus the area for the noncombustible material, may be considered as indicating the fuel value contributed by the combustible sample. For purpose of classification, the area under the curve for the asbestos cement board is considered as zero, and the difference of the area under the curve for red oak and that for asbestos cement board is considered as 100 value or factor for fuel contributed.

*Now, more than ever...*

# A SYMBOL OF FRIENDLY COMPANIONSHIP




As people adjust themselves to the new wartime routine, little things—everyday pleasures, take on new importance. Now, more than ever, Pabst Blue Ribbon Beer has become a symbol of friendly companionship.

That softer, kindlier taste of Pabst Blue Ribbon is achieved by *full-flavor blending*—a Pabst process that gives you all the taste tones of a well-rounded beer. Next time the occasion calls for beer, try Pabst Blue Ribbon. There is no finer beer in all the world.

**33 FINE BREWS** *blended into*
**ONE GREAT BEER**

Pabst Blue Ribbon

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**Johnny, Get Your Gun!**

Before John Murdock convinced skeptical Londoners of 1815 that his new discovery, coal gas, was a fuel and not a conjurer's trick, he had to find pipe that would convey the gas safely. Pipe of available materials such as lead, wood and clay either leaked, broke or fouled chemically. Finally, John tried a gun barrel. It worked! If one gun barrel was good, a mile of them would be perfect! So reasoned Murdock, as he spliced and, by heat and hammer, welded all the gun barrels he could buy, borrow or beg, into the world's first steel pipeline. Those gun barrels were the beginning of the present network of little and big inch steel pipelines and safety cylinders and carriers which transport liquid and gas fuel everywhere.

For nearly a century, The Harrisburg Steel Corporation has been known among oil and gas industries for seamless steel products which must meet exacting demands with excellent service and perfect safety. Some of these oil and gas products are seamless steel pipe couplings, pump liners, hollow and drop forgings and pipe flanges. Harrisburg also manufactures seamless steel high pressure cylinders, and liquefiers, alloy and carbon steel, coils and bends. Every "Harrisburg" product conforms with the highest standards in test and inspection.

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The spread of flame is determined by observing the time and extent to which flames have developed on the surface of the test sample as the result of the exposing fire. By evaluating the distance or time of spread of fire for each material in comparison, with that developed for red oak as 100 and asbestos cement board as zero, a numerical classification may be established.

Smoke developed is determined by recording the reduction of light due to smoke passing between the light source and a photoelectric cell during the test. If it is desired to classify relatively and on a comparative basis the smoke developed by the various materials, it is proper to assume a factor of 100 for red oak and a factor of zero for asbestos cement board. The integration of the areas under the curves may be considered as proportional to the light absorption by the smoke and a numerical classification may be established.

Samples of gases may be withdrawn from the vent end of the test equipment; the method of sampling and analysis is decided upon the basis of knowledge of the chemical constituents of the product under investigation.

### Present and Future Use of Treated Wood

The progress made in the art of treating lumber to reduce its combustibility, and the scarcity of noncombustible building material has prompted the use of treated lumber in buildings recently erected for industrial purposes and the use of our armed forces. In 1942 more than 22 million board feet of lumber were treated, while in 1943 this was increased more than three-fold. The demand created by the war effort has stimulated interest among producers to develop information needed to justify the use of treated lumber in locations where fire protection is essential. The future utility of treated lumber will, to some degree, be dependent upon data which will be obtained by continued test and research.

## ARMY AND NAVY

(From page 19)

of engines, airplanes, radar, or some other technical specialty at an Army training center. Misfits will naturally be returned to troops.

### Meeting Military Needs

Each program seems to be meeting the particular needs of its sponsoring service. The Navy is building the



# *Hands that Command the Nation*

THE TECHNICAL KNOWLEDGE, the ingenuity and the resources of America are at the disposal of our skilled medical officers on the fighting fronts of the world. They command every aid the nation can supply. That is one reason why a wounded man's chances of survival are greater today than they have been in any other war.

Among the materials that are helping medical men in their fight to save lives are the *stainless steels*. Used in operating tables, surgical instruments and in other medical equipment, stainless steels are serving in hospitals in this country and overseas.

Frequent sterilization with high temperature steam or strong disinfectants will not injure stainless steels. Their smooth, hard surface is easily kept free from germs that can cause fatal infection. Even in the damp tropics, stainless steels do not rust. Tough and durable, free from the possibility of chipping, stainless steels can withstand the rigors of wartime use.

On the home front, too, stainless steels are making their contribution to the health of the nation. Because they are easier to clean and keep clean than other metals, they are widely used in equipment necessary to the processing, preparing and serving of foods. They keep their bright finish, impart no flavor to food, and resist food chemicals. They will be used increasingly in restaurants, in the home, and in many industries where their unique properties are so desirable.

Stainless steels are "stainless" because they contain more than 12 per cent chromium. Low-carbon ferrochromium, a research development of ELECTRO METALLURGICAL COMPANY, a Unit of UCC, is the essential ingredient in the large-scale production of stainless steel. Units of UCC do not make steel of any kind. They do make available to steelmakers many alloys which, like ferrochromium, improve the quality of steel. The basic research of these Units means useful new metallurgical information—and better metals to supply the needs and improve the welfare of mankind.

▼

*Members of the medical profession, architects and designers are invited to send for booklet P-3,* "THE USE OF STAINLESS STEELS IN HOSPITALS." *There is no obligation.*



**CARBON FOR HEALTH.** Research by a UCC Unit has resulted in different forms of carbon used in milk irradiators, "sun" lamps, gas masks—and in air conditioning installations.



**GASES FOR HEALTH.** LINDE oxygen U.S.P. made by a Unit of UCC is used by the sick in hospitals and at home—and it contributes to the safety of our high flying aviators.



**CHEMICALS FOR HEALTH.** Synthetic organic chemicals, developed by a Unit of UCC, mean better anesthetics, more plentiful sulfa drugs, vitamins and other pharmaceuticals.



**PLASTICS FOR HEALTH.** BAKELITE and VINYLITE plastics, produced by UCC Units, mean sanitary paints, floor coverings, sheeting, "burn sleeves" and other essentials.

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The Prest-O-Lite Company, Inc.

**PLASTICS**
Bakelite Corporation
Plastics Division of Carbide and Carbon Chemicals Corporation

greatest fleet of all time. It will continue to need a steady flow of young officers with an engineering education. The V-12 program is already starting to produce this flow of trained personnel as other sources of officer material decline. The Army seems to have more officers than it can use, but the branches of its service are voracious in their needs for men with good technical training. Large numbers of persons were given limited technical training early in the war without the benefit of fundamental studies in mathematics, physics, and chemistry. The result was not a failure, but many persons in the army realize that men with broader technical education will prove more useful. The Army program, even at the upper level, will not produce a fully qualified engineer, but the engineering technicians that it does provide will be able to meet most emergencies in the limited fields to which Army organization restricts the functions of its personnel.

### After the War

It is interesting to speculate upon the influence of the military programs upon the country and the profession of engineering after the war. Adding together Army, Navy, and civilian engineering programs at the present time would produce a total enrollment figure well above 200,000, which is double the average enrollment of our engineering colleges for the last few years preceding the war. Of course, most of these students are not destined to go beyond the equivalent of the freshman year during the war period, but they will also be given some kind of specialized technician training by the army.

Probably this pool of technically trained military personnel will be drawn upon by the engineering colleges for several years after the war. Its existence even points to the possibility of a veritable flood of post war engineering students beating at the college gates. If we assume that the war ends completely in 1945, the year 1946 may see persons from the following groups ready to matriculate in our engineering colleges: (1) high school graduates of the year 1946 who alone could be expected to fill our engineering schools with a full complement of freshman students; (2) high school graduates of the years 1940-45 who were distracted from normal entrance into engineering study by the war; (3) college sophomores, juniors, and seniors from several classes returning to complete an engineering education; (4) high school graduates and non-graduates who became interested in engineering in the Army or Navy and who then




*"He's In the Army Now!"* His name is Billy Fritts and when this picture was taken just a few weeks ago, he was a part of our wood-working production force. Now Billy is a part of a bigger force, the United States Army.

**We're ALL In the Army**

Several members of the Schenk "family" are now in uniform. But whether in uniform or work clothes, all of us feel we're *"in the army."* Over 67% of our production is direct war work, and it ranges all the way from desk trays for war offices to braces used in packing 37-millimeter and 75-millimeter shells.

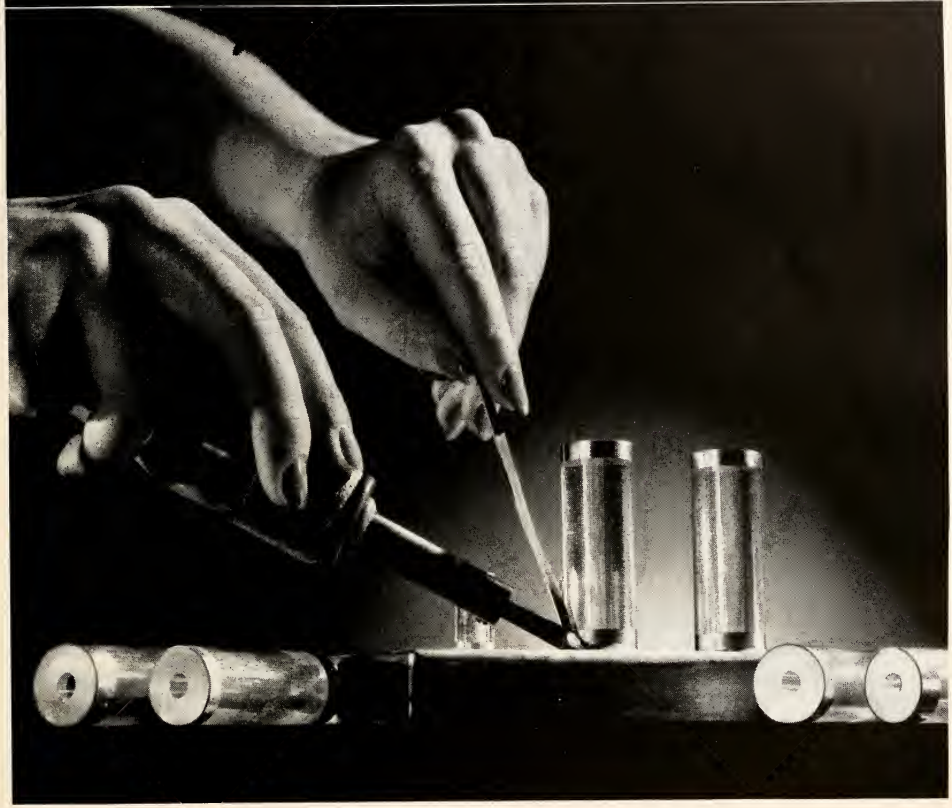
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# Imagine soldering metal to Glass!



HERE'S one for the book! The young lady is soldering metal to glass to make an important piece of electrical war equipment, and she doesn't have to be fussy about it either. She just solders!

The reason this can be done today is that some time ago Corning developed a method of firmly attaching a thin film of metal to glass, as a base for the solder. It was just one of many glass-metal problems that were once called "impossible."

Being ready with ideas has been the glass industry's greatest contribution to our war effort. That, and the ability to mass produce essential glass without delay.

Take Corning for instance. Here research found ways to mass produce essential optical ware. Insulators, aerial and naval navigation lenses, bulbs for electronic tubes, these and countless other war needed items are being turned out in vast quantities.

On the civilian front, Corning right now is supplying glass piping, and valves, nuts and bolts that resist chemical attack. Glass springs that apparently never wear out. Glass acid pumps that replace scarce metal alloys and give longer service in the bargain!

Glass isn't taking a back seat now, or after victory. Too many people are finding out something about its unusual qualities to ever let this happen.

They are discovering that glass is versatile. It has astounding strength. It can be shaped with great accuracy. It resists corrosion and abrasive wear. And they're finding out, too, that Corning knows glass, not only as a producer but as a developer of glass ideas.

In engineering, too, glass is a material with a brilliant future . . . In the years to come, keep your eye on glass! Corning Glass Works, Corning, N. Y.

CORNING
*means*
Research in Glass

received some specialized instruction in a technical field, and (5) V-12 and AST students who failed to get a degree in engineering and who will return for that purpose.

Thus we visualize the possibility of a great flood of young people demanding the right to college study after the war, with the engineering college placed in the center of the whirlpool. The direct influence of government scholarships and the indirect effect of a possible satiation with all things technical are yet to be made clear. But with our economy so clearly dependent upon technological progress, there seems to be no likelihood of the engineering college becoming a quiet restful spot in the discernible future.

## INDUSTRIAL TRAINING

(From page 21)

1940, to be republished this year, showed a shocking picture as far as training was concerned in the Greater Chicago Area at that time. Undoubtedly, this reflected the usual philosophy of management in poor years which is to trim off those activities which management considers to be "unproductive."

The personnel services have long suffered through management's refusal to recognize their monetary worth to the extent of maintaining them in periods of business retrenchment. It is difficult to say how much of this can be laid on the shoulders of personnel men who as a group seem not to have been aggressive in developing yardsticks for measuring in dollars and cents the value of their activities. It is true that it is more difficult to demonstrate the dollar savings or the dollar earnings of a more efficient training program than it is for the plant superintendent to demonstrate the dollar earnings or savings of a new and more efficient machine. The solution of this difficulty will lie partly in a sharper recognition on the part of personnel men of the need for yardsticks and partly in a greater understanding on the part of management that there are intangibles in business that have very real values. Certainly, it would seem no accident that those managements which are aware of this, and which maintain as an integral part of their organizations training departments and sound training programs, are usually those managements which prove to have businesses that weather economic storms and grow over the years.

At the close of our first World War the larger companies of this country recognized the value of the mental testing manual, and their research development and refinement of selection tests have done much to aid in placing workers in those jobs where they will find the greatest outlet for their abilities and where their companies can make the greatest profits from their efforts. This has been proven by the fact that the testing of employees is thoroughly established in our large business organizations and has over the years shown a consistent spread into the smaller organizations. Just so, the newer types of training programs conceived in this war will be developed and refined first by the larger companies, and accepted gradually by smaller ones in the years of peace to come.


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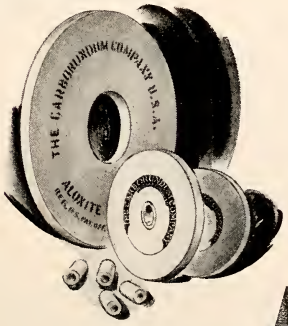
# The glass "yardstick" that can't tell a lie!



Now they're making precision gages, on which mass output of planes and other weapons depends, out of glass. Why glass? It saves strategic material. Can't rust or corrode. Is less affected by heat. Surface scratches or knicked edges don't impair its accuracy. Costs less. Lasts longer. And it can't tell a lie. If a glass gage is dropped, either it breaks or is as good as new; there is no unsuspected distortion.

To turn molded glass into a precision instrument requires careful, accurate grinding. Carborundum makes grinding wheels with which plug, ring and snap gages of glass are quickly ground to the required accuracy and finish. This latest use of grinding is another example of the increasing importance of abrasives in war production.



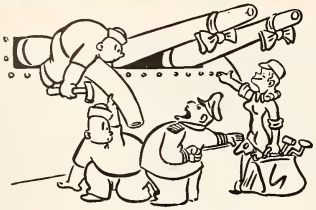



When you get out into industry, remember that Carborundum research and experience are at your disposal, ready to help you solve any abrasive problem you may encounter. The Carborundum Company, Niagara Falls, New York.

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It *was* a man's world. Then came the war! Then came the call for workers of the fair sex. Thousands of 'em—"God-Bless-'em." Well, we're neutral in this battle of the sexes for whether you're a big rugged he-man ruling bold black outlines for a dreadnaught or a choice bit of femininity putting the finishing touches to a design for a dainty dial, Higgins will match your skill with "Beautiful" working quality.

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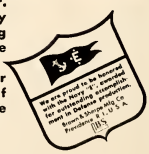


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The pressure of war-time production has demanded of Babcock & Wilcox an ever-greater share of the responsibility for producing boilers for increased-capacity steam generating plants. A large number of Public Utilities, Industrial Power Plants and Ships have been equipped with B & W Boilers of modern design. These improved boilers will be available for FUTURE use in ALL industries. It would be well to familiarize yourself with B & W Boilers NOW.




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## WISHNICK-TUMPEER

(From page 23)

facture of chemical specialties were added in Chicago.

Like all others in the chemical industry, Witco Chemical Company is actively engaged in war work, with its laboratory concentrating particularly on the study and solution of synthetic rubber compounding problems.

It has now been appointed sole distributor of the complete line of blacks manufactured by the Continental Carbon Company at Sunray, Texas.

In announcing this appointment, Robert I. Wishnick, president of Witco Chemical Company, as well as of Continental Carbon Company, stated, "The combined research and rubber testing facilities of both companies are now made available to consumers of WITCO and CONTINENTAL blacks, which will enable us to offer a broader service and added technical assistance in the compounding problems imposed by the synthetic rubber program."

Mr. Wishnick, a trustee of Illinois Institute of Technology, is an Armour graduate of the class of 1914.



In addition to steel storage tanks, Hortonspheres, Hortonspheroids and other steel plate work, the Chicago Bridge & Iron Company is building a large number of tank landing ships like the one shown here.

## RED CROSS

(From page 25)

All activities of the American Red Cross are financed by voluntary gifts and contributions. During March, designated by President Roosevelt as Red Cross Month, the American Red Cross must raise its 1944 War Fund of unprecedented size to meet unprecedented needs. Your contribution will assure maintenance of all Red Cross services and thus indirectly help save many a life. Let's give!

## HELP!

(From page 27)

System calls them, you had better organize and start a campaign to show your needs. If you must have engineers and you cannot get them or retain your younger engineers; if your production falls off, don't hold the bag. If you do not show cause why you need engineers, and if production slumps, the public and the Selective Service System will blame you for not fighting to the last court of appeal.

After your study of the table of the distribution of draft registrants, you will find over 13,000,000 males eligible for service. Fewer than one per cent of these 13,000,000 men are engineers of military age working in industry. During the last three years many young engineering graduates have entered the service. So, if you eliminate the 4-F's, it is my opinion that about two to three divisions are all that could be gleaned from the engineers aged twenty to thirty-seven holding B.S. degrees from accredited engineering colleges. Can industry spare them with the supply yearly cut off at the source? Maybe in the light of the social pressure against putting fathers in the service, you had better write your congressmen and your state directors governing your draftees, and above all, tell your draft boards the story of what your engineers have done, can do, and will do. Emphasize the years of training necessary, how few men there are in relation to the number needed and remember that the source of your supply is nearly cut off.

## POWER CONFERENCE

(From page 28)

Electrical Engineering, Northwestern University.

(d) Discussion.

3:45 P. M. Diesel Power. M. P. Cleghorn, Chairman.

(a) Closed Evaporative Coolers. William Goodman, Consulting Engineer, Trane Company, La Crosse, Wisconsin.

(b) Isolation of Vibration from Diesel Plants. H. H. Fink, Product Design Engineer, The B. F. Goodrich Company, Akron, Ohio.

(c) Discussion.

For copies of the final program and for other information, address Stanton E. Winston, Conference Director, or Charles A. Nash, Conference Secretary, Illinois Institute of Technology, 3300 Federal Street, Chicago 16, Illinois.






## MOTORS KEEP GYROS SPINNING

Gyroscopes are of major importance in this war. They hold guns steady for firing in spite of the diverse movements of the vehicles; they are a part of our most important bombsights; they help steer torpedoes and scan the sky for evidence of the enemy; they serve in compasses and in many other devices. Westinghouse engineers have had to design many new and special electric motors to drive these fascinating gyros at their high speeds of several thousand revolutions per minute.

One motor is called upon to bring its gyro flywheel to full speed of 12000 rpm in two-tenths of a second. This motor—about the size and shape of a beer bottle—weighs but 10.5 pounds but develops 22 hp. To get the 600 amperes into the armature, the brushes must work at a current density of 1600 amperes per square inch.

Another gyro required a motor of super construction accuracy. To insure absolutely vibration-free operation, the weight must be almost perfectly distributed. To balance these rotors, special dynamic balancing machines using the Westinghouse Dynetric principle had to be built. Eight time more sensitive than Dynetric balancers ordinarily used in precision work, these machines are able to detect an excess or shortage of weight on the 5-inch diameter flywheel of but one ten-thousandth of an ounce. The balance of these wheels is so sensitive that a burr on the balance screw will affect the operation. The machining and balance is such that the trueness of the whole system is of the order of one-millionth of an inch with respect to the bearing. All parts are made on a production basis and are

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completely interchangeable. To do this it is necessary that all finishing operations be performed in temperature-controlled, dust-free rooms. These tiny motors, with armatures only a little larger than a wine glass, bring the gyro flywheel up to 1600 rpm in about 40 seconds. After power is shut off it will coast one-half hour or longer before stopping.

Other bantam gyro motors include several that consume but three watts (about 1/250 hp). The rotors for these baby motors—including commutator and shaft—are about the diameter and length of a thumb. One d-c shunt-wound, 24-volt motor drives its gyro wheel at 14000 rpm. Two others are supplied with three-phase current, one at 240 cycles (14000 rpm) and another at 400 cycles (12000 rpm). The 240-cycle motor with a rotor less than one inch in diameter and less than one inch long carries a four pound flywheel. Still another is a single-phase capacitor-type, 3400 rpm, 60 cycle motor having an output of about one watt (1/750 hp).

These tiny high-speed motors must operate under trying conditions. They must be able to start their high-inertia loads with the temperature at 40 degrees F below zero and run continuously with outside air at 130 degrees F. This involves a severe lubrication problem, especially so since space for lubrication is small. The motors are totally enclosed and are confined in tight housings along with other heat-producing apparatus; thus the temperature problem is doubly aggravated. Were it not for special low-loss iron used for a-c stators and d-c armatures, the motors would literally burn.

Similar to their larger companions, the tiny gyroscope motors must be precisely balanced—and must retain that balance. Because ordinary varnish might soften at the high operating temperatures and deform (destroying balance), special thermosetting varnish is used that won't shift when hot. Even the standard progressive winding cannot be used in the d-c armature because it does not distribute the mass of copper around the rotor with sufficient uniformity to provide the precise balance required.

## ELECTRICAL SYSTEMS OF TOMORROW'S AIRCRAFT

Electrical engineers, working closely with the Air Forces, are now making intensive engineering investigations on practically every piece of apparatus in the generation, distribution, and utilization systems of tomorrow's large high-altitude war planes, according to W. K. Boice and L. G. Levoy, General Electric aircraft application engineers. In a paper presented before the winter technical meeting of the American Institute of Electrical Engineers in New York City, the two G-E engineers outlined many of the basic considerations in the selection of electrical systems for large aircraft.

A considerable part of the paper was devoted to a discussion of 400-cycle alternating-current systems proposed for certain large military planes. It was pointed out that General Electric has already designed an extensive line of 400-cycle a-c aircraft equipment including generators, regulators, switchgear, control, transformers, motors, rectifiers, instruments, and fuses.

Declaring that for large high-altitude aircraft, a-c holds high promise, the speakers stated that "the simplicity, low maintenance, safety, and light weight of a-c motors and generators tends to favor the use of a-c. Commutation and brush wear problems are minimized, and the development of very high speed motors appears more promising with a-c. Various desired utilization voltages can be obtained by transformers, which are lighter and simpler than d-c voltage converters.

"Present indications do not point to the use of a-c in all types of planes. The 27-volt (24-30 volt) d-c electrical system used in Flying Fortresses and Liberators is performing in a most satisfactory manner," explained the speakers. "However, the size, performance, and electrical load requirements of proposed new planes are such that the 27-volt d-c system will not be adequate or efficient from the standpoint of weight, thus making it necessary to consider new types of systems.

"Aircraft electrical systems have undergone continuous evolution since the advent of the airplane. Early planes used a 6-volt d-c system, patterned after the automobile. Increasing power requirements led next to the adoption of 12-volt systems and later to the 27-volt d-c systems now in wide use. A few planes have been operated with 120-volt d-c systems, and some with a-c systems with various frequencies ranging from 60 to 2400 cycles per second.

"While the power system is always tailored to the airplane, there are some variables such as operating voltage and frequency, which can be standardized advantageously at certain levels. The U. S. Army Air Forces are contributing to electrical progress in this respect by their standardizing and co-ordinating work. The selection of 400 cycles for a-c systems for certain large military planes is a recent example."

In view of the work that has been and is being done, the aircraft industry will have at its disposal electrical systems at several voltage levels, depending on the amount of power used and transmission distances. These include 6- or 12-volt d-c systems for very small or private planes; 27-volt d-c systems for small and medium size planes; 27/120-volt d-c systems for large, medium altitude cargo or transport planes; and 120/208-volt 400-cycle a-c systems for large, high-altitude long-range planes.

Messrs. Levoy and Boice pointed out some of the a-c system problems with which electrical engineers are now working. The generators of both a-c and d-c aircraft systems are usually driven from main engine accessory power take-off shafts. With a-c generators whose frequency is constant, it is necessary that some form of variable ratio transmission be used to maintain the alternators at substantially constant speed in spite of variations in engine speed. In addition, where several a-c generators operate in parallel rather than independently, they must run at exactly the same speed in order to maintain synchronism.

Considerable development work is now in progress on variable-ratio constant-speed transmissions and governors to provide a constant-speed drive for the generators. Fully automatic synchronizing equipment for 400-cycle a-c aircraft systems has already been designed.

The G-E engineers expressed the opinion that the selection of 120/208-volt, 400-cycle, 3-phase as a voltage and frequency level for a-c systems in aircraft has proved a particularly happy choice in that this voltage is high enough to transmit the required amounts of electric power economically over the distances required by the largest planes, and is high enough for the largest amounts of auxiliary electrical power in any planes now being designed or likely to appear in the near future. The voltage is low enough so that no unusual difficulties are experienced in switching, even at very high altitudes.

It was pointed out that the proposed system would retain a relatively small 27-volt d-c system derived from the main a-c system, since d-c is more suitable for control, instruments, and similar very small loads.

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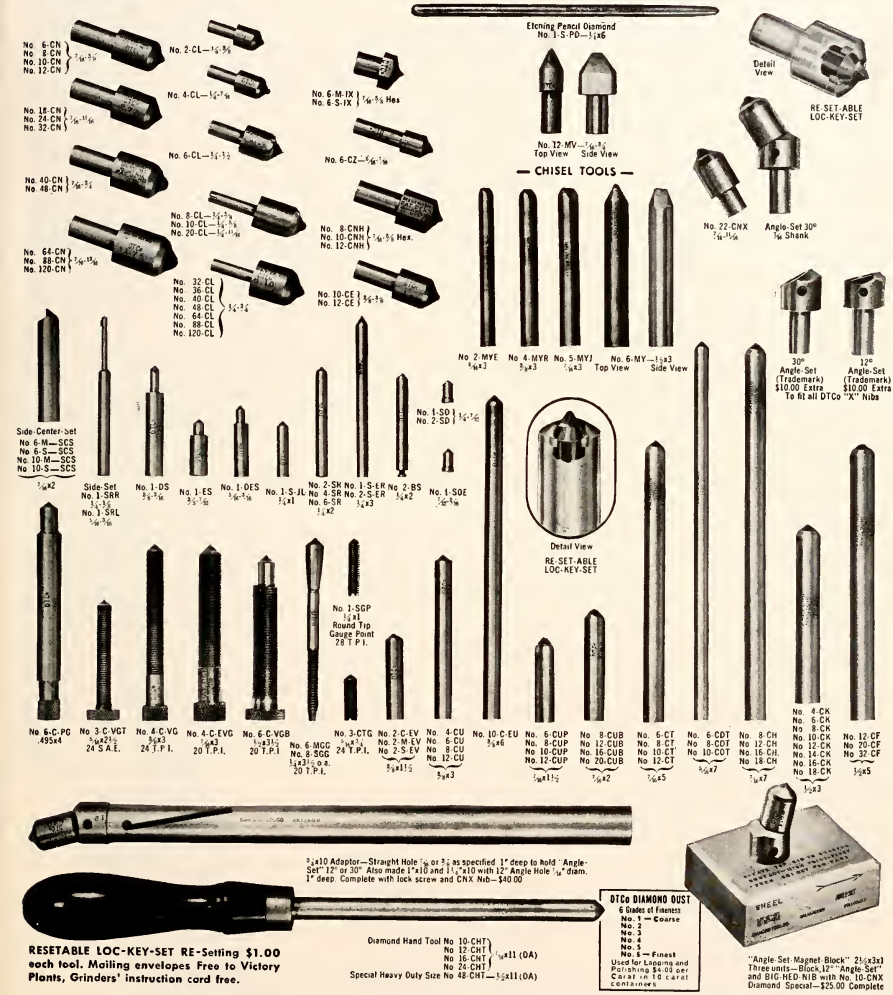
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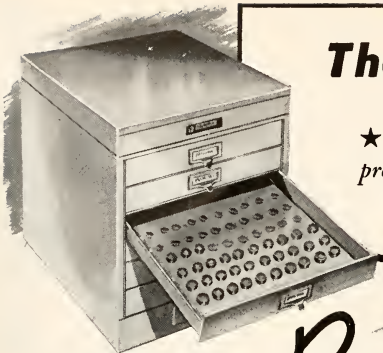

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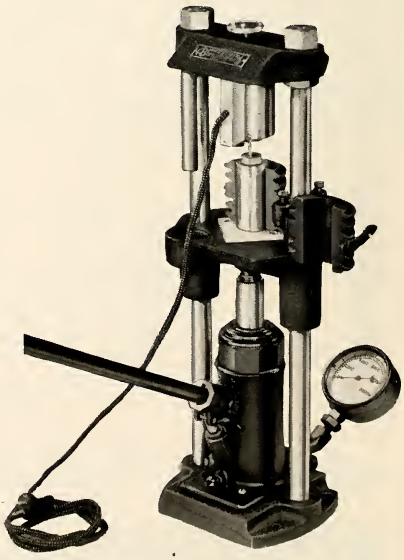
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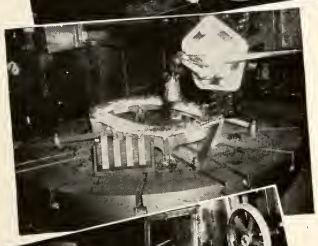
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***In Naval Ordnance Plants!*** Here again carbide tools have a job to do—and are doing it! Typical is the milling of steel breech casing at a midwestern U. S. Naval Ordnance Plant. Carboloy mills—operating at 650 S.F.P.M., 7½" table travel—eliminate one milling machine and two grinders through faster operation and better finish obtained.

★

***On the High Seas!*** When repairs are needed far from port—the Navy is prepared! "Floating" machine shops with modern, efficient equipment—including carbide tools—are a standard part of large Naval vessels.

IN U. S. Navy Yards, in Naval Ordnance plants, aboard naval vessels, and in all important plants of suppliers to our navy, you'll find carbide tools helping to speed up schedules—turning out the steels of war!

The ability of carbide tools to machine at high speeds, produce an unusually high quality of finish, reduce machine downtime, and cut heretofore non-machinable alloys, has been put to extremely good advantage by those charged with the responsibility for the greatest naval production in history.

★

Every facility of Carboloy Company has been made available to the U. S. Navy in an all-out program of cooperation. Carboloy representatives from coast to coast are on call whenever needed; Carboloy Training Films are at work helping speed naval training activities in the field; and the Carboloy Training Course at Detroit has trained, and is continuing to train, key navy men responsible for carbide tool use in naval production.

**CARBOLOY COMPANY, Inc., Detroit, Mich.**

Birmingham, Ala. • Chicago • Cleveland • Los Angeles
Newark • Philadelphia • Pittsburgh • Seattle • Thomaston, Conn.

*Canadian Distributor:* Canadian General Electric Co., Ltd., Toronto, Canada. *Foreign Distributor:* International General Electric Co., Schenectady, N. Y.

TUNGSTEN CARBIDES for Cutting CAST IRON and Non-Ferrous Metals

# CARBOLOY

(TRADEMARK) CEMENTED CARBIDES

TITANIUM TANTALUM CARBIDES for Cutting STEEL

FOR HEAVY HOGGING • • • PRECISION FINISHING • • • INTERMITTENT CUTTING

# FOR MORE EFFICIENT POSTWAR PRODUCTION...



← No interruptions or delays in getting paper-work, tools and gauges wherever required throughout the plant.

Synchronized with tubes, conveyors provide a smooth, efficient flow of parts and materials. Everything is at the right place at the right time. ↓



## CO-ORDINATED *Control*

With Lamson Conveyors moving materials and work-in-process in a steady flow, and Lamson Dispatch Tubes speeding paper-work throughout the plant . . . men, materials and machines are integrated into an efficient, easily adjustable, easily directed production unit. Co-ordinated Control will be more necessary than ever in the postwar industrial picture, when the ability to meet competition will again determine the measure of success.

Lamson manufactures both conveyors and dispatch tubes — but more than that, Lamson is an organization of materials-handling engineers, well qualified, by experience, to aid in blue printing postwar production. They have prepared a booklet containing many valuable suggestions. You are sure to profit by its timely information . . . Send for it by filling in the coupon below.




## LAMSON Conveyors and Tubes

***Tools for Co-ordinated Control***

LAMSON CORPORATION
1960-2000 Lamson St., Syracuse 1, N. Y.

☐ Send me free copy of "Co-ordinated Control".

Name.....Class.....

College.....

Address.....State.....

*Because of the paper shortage, this booklet can be sent only to those who name their college and class.*

# IT HAPPENED AT ILLINOIS TECH

## *in 1943*

In the daily life at a large college, one day follows another without much departure from the business of classroom and lab routine. Things go on apace, however, behind the scenes. Some we learn about as we go, others take place under the veil of scientific secrecy. But, when viewed in retrospect, the accomplishments of a year's work assume huge proportions. . . . In a war year like '43, civilian training and military training, too, are seen in their proper relationship to the needs of the times. . . . We have set down here some of the accomplishments of the college in 1943. As the days following graduation pass into years, you may want to know "What did my college do in the war year of 1943." This page will be an interesting reminder.

**TRAINING ENGINEERS AND SCIENTISTS.** To help alleviate the acute shortage of men and women in all branches of engineering and science, whether in civilian or military activity, Illinois Institute of Technology carried on its regular courses, graduating a total of 437 men and 47 women.

**ROUND-THE-CALENDAR EDUCATION.** In July, 1943, Illinois Tech went on the accelerated plan of three 16-week terms. Students of 1943 will recall Thanksgiving as just another day in classrooms. Those with early classes will remember how the first class started at 7:30 a.m. instead of 8:10 a.m.



CHICAGO SUN PHOTO

**DEVELOPMENT PROGRAM.** On January 11, 1943, the quarter-million dollar Metals and Minerals Research Building for the Armour Research Foundation, the first unit in the $3,100,000 campus development project was dedicated. The illustration here is of President Heald participating in the dedication ceremony. Construction has been started, and is now nearing completion on the Automotive Research Laboratory Building for the Armour Research Foundation and on the Parmly Foundation for Auditory Research Building.

**BLOOD DONATING RECORD.** Illinois Tech was the first college in this area to donate sufficient blood for the Red Cross Mobile Unit to visit, not once but three times in '43! 381 pints were donated in three days during the first visit . . . the most given in three days up to that time to a Mobile Unit. Again in August, 512 pints set a still higher record. A total of 1138 pints of blood was donated by the students during 1943.



CHICAGO TRIBUNE PHOTO

**RESEARCH.** The very nature of this work under war time restrictions veils itself in secrecy. The veil can only be lifted after the war is over. More than 30 different projects, however, are under way at Illinois Tech.

In 1943 the erection of the wind tunnel was completed. The electron microscope, a rare, scientific instrument, became available. It is the only one in the Chicago area, the 34th in the nation, and the 41st in the world.

**STUDENT WAR COUNCIL.** Organized in January, 1942. Carried on the good work through 1943, becoming very active in the salvage drive. Assumed full responsibility for posting of Air Raid notices around the schools. Assisted in rationing negotiations in a suburban school district where an insufficient number of teachers was available for this purpose.

**WAR TRAINING PROGRAM.** In 1943 Illinois Tech retained its position of operating the largest war training program (ESMWT) in a single city in America. Forty-two thousand persons have been enrolled up to December 31, 1943. Thirty-four thousand since Pearl Harbor . . . 22,574 this year. In 1943 the emphasis changed to In-Plant courses. More than thirty plants now have such schools operated by Illinois Tech. The fulltime pre-employment courses for women also reached their peak in 1943. The illustration here is of the 1000th woman graduating from these courses. More than 1100 women have been trained as war technicians by Illinois Institute of Technology, of which 563 graduated in 1943.



LOOP PHOTO

**SIGNAL CORPS TRAINING SCHOOL.** At the request of the United States Signal Corps, this program was inaugurated in 1942 and carried through to completion in 1943. 4,316 students in pre-radar were trained. To provide classrooms equipped for the purpose, Illinois Tech took over a garage building, called it Pre-Radar Hall, and leased the Northern Illinois College of Optometry. The school was closed July 31 when the student instruction in this course was completed.

**EXPLOSIVES SAFETY SCHOOL.** Formally known as the "School for Safety Auditors," this school was established in August, 1942, at the request of the Office of the Chief of Ordnance, War Department. Illinois Tech was selected to organize and administer this school for two reasons: (1) its outstanding war training record (2) its work in conducting the nation's only Department of Fire Protection Engineering. The instruction carried on through 1943, training munitions experts to take places in varying capacities in 600-odd munitions plants. Students in this school are specially selected by the Army and Civil Service. Of the total of 366 trained, 251 graduated in 1943.



LOOP PHOTO

**STUDENTS IN UNIFORM.** Both the Army (ASTP) and Navy (V-12) came to Illinois Tech in 1943. Thus, Illinois Tech became one of a few colleges with both Army and Navy men in the student body. Approximately 700 Navy men and 500 Army cadets attended Illinois Tech at all times. The Navy men were a part of regular college activities, while the soldiers attended classes conducted exclusively for them.

*Illinois Tech*

CONSOLIDATION OF ARMOUR AND LEWIS INSTITUTES

3300 S. FEDERAL ST. CHICAGO 16, ILLINOIS PHONE VICTORY 7200

(A page from the 1944 *Integral*, student yearbook of Illinois Institute of Technology. It is reproduced here for its news value to readers of the *Illinois Tech Engineer and Alumnus*—and because it is felt that it will be of more interest than any page of advertising Illinois Tech might present.)



# THE FUTURE WILL BE YOUR RESPONSIBILITY!

## *learn to know your Bearings* NOW

American colleges turn out good engineers. That's why so many of the world's greatest engineering achievements stand to America's credit.

The world of the future will be a world of wheels and wings to an extent that cannot be completely foreseen now. But one thing is sure—it will be a world of bearings, too, for wherever wheels or shafts turn, they must turn on bearings.

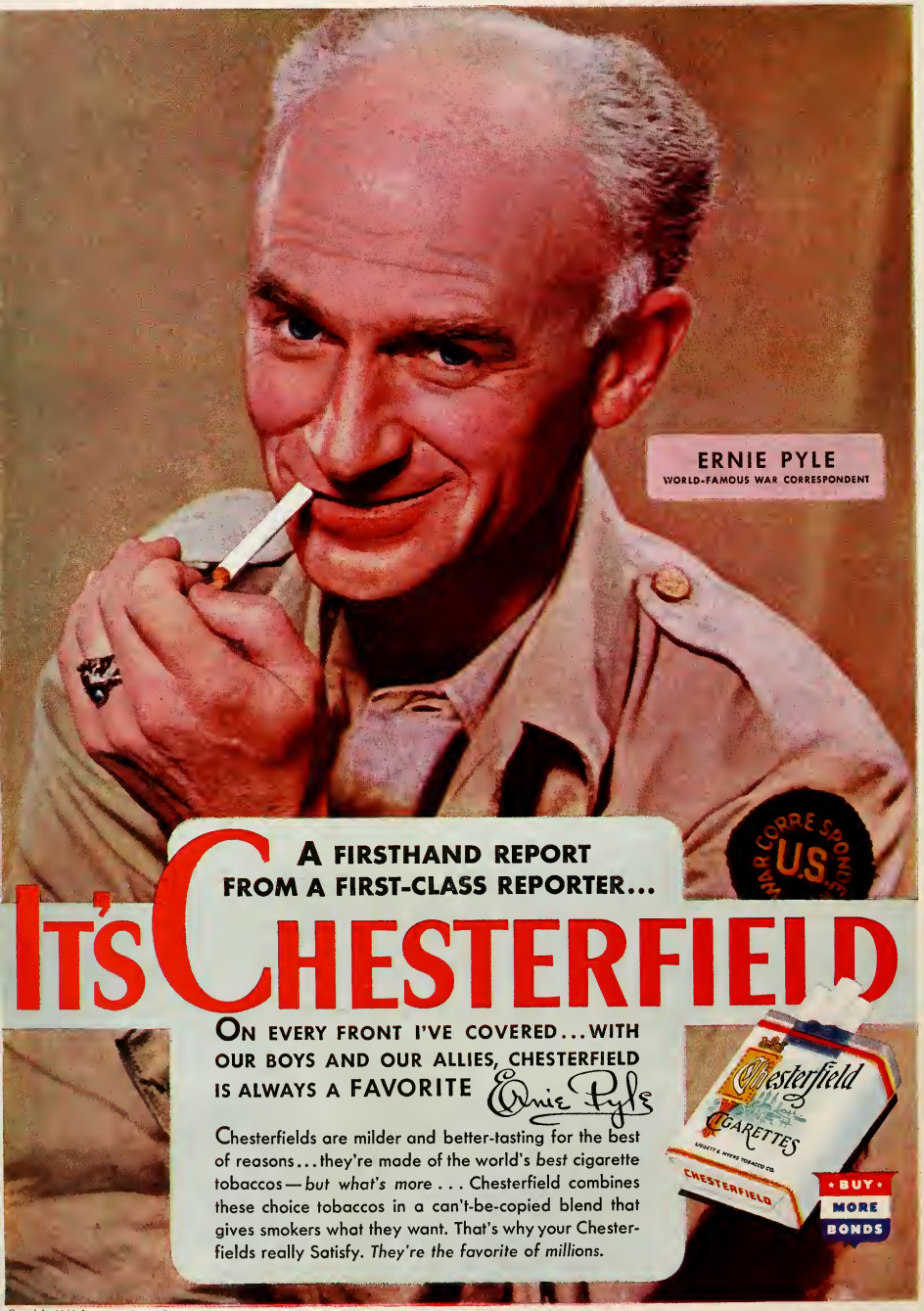
It is not too much to say, in view of their present dominant position, that it will be a world of Timken Tapered Roller Bearings; for there is no bearing requirement that Timken Bearings cannot meet.

So, while you are still studying, learn to know your Timken Bearings thoroughly —their design, application and potentialities. Then you'll be still better equipped for your job when college days are over and you take up the responsibilities of a full-fledged engineer. The Timken Roller Bearing Company, Canton, Ohio.

**TIMKEN**

TRADE-MARK REG. U. S. PAT. OFF.

*TAPERED ROLLER BEARINGS*




A FIRSTHAND REPORT
FROM A FIRST-CLASS REPORTER...

# IT'S CHESTERFIELD

ON EVERY FRONT I'VE COVERED...WITH OUR BOYS AND OUR ALLIES, CHESTERFIELD IS ALWAYS A FAVORITE

Ernie Pyle

Chesterfields are milder and better-tasting for the best of reasons...they're made of the world's *best* cigarette tobaccos—*but what's more* . . . Chesterfield combines these choice tobaccos in a can't-be-copied blend that gives smokers what they want. That's why your Chesterfields really Satisfy. *They're the favorite of millions.*




Copyright 1944, Liggett & Myers Tobacco Co.

# ILLINOIS TECH ENGINEER

## AND ALUMNUS



MAY, 1944



# Out of a Flame – New Strength for Rubber

Like a modern Phoenix rising out of a flame comes a product that brings *new* strength and longer life to synthetic rubber. This product is *Furnace Type* Carbon Black, a fine black powder "engineered" to microscopic particle size by burning natural gas in a special combustion chamber.

Furnace Type Carbon Black imparts to both natural and Buna S rubber the tensile strength, abrasion and tear resistance that make our modern tires possible. But it does more—it greatly reduces the tendency of Buna S tires to generate excessive heat. And because *more of it* can be used successfully as a reinforcing agent in synthetic rubber formulas, it is helping to "stretch" our vital Buna S supplies. Thus it is now one of the most essential materials in our synthetic rubber program.

To help meet the tremendous demand for Furnace Type Carbon Black, Witco is supplying the rubber industry with increasing quantities of CONTINEX Furnace Blacks. Produced in a new plant recently completed at Sunray, Texas, these CONTINEX Blacks will see service in thousands of tire treads . . . will help to keep our armies rolling ahead faster on better "shoes."

For more than two decades Witco has worked closely with rubber, paint, printing ink and other industries...meeting their constantly varying demands for carbon blacks, as well as chemicals, pigments, asphalts and other materials. Perhaps your production or postwar plans can benefit from Witco's continuing program of research and product development. We invite you to submit your problems to our technical staff.

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# Campus News

RESEARCH AND ENGINEERING KEEP GENERAL ELECTRIC YEARS AHEAD



## AUTOMATIC PILOT

FLYING blind most of the time, a pilot has a hard job keeping his plane on its course. An automatic pilot, electrically-driven, allows him to relax occasionally . . . to save his physical and mental resources for the job that may, and often does, lie far ahead.

An electric motor spins 12,000 revolutions per minute to keep the gyroscopic mechanism, guiding power of the automatic pilot, rotating at constant speed. The unit is tightly sealed to insure constant speed of rotation even when the air outside contains many dust particles, or its temperature is very low.

The automatic pilot is able to take over the controls and hold the plane on a predetermined course. Any pitch, roll, or yaw—that is, lengthwise or crosswise tilt or turn of the plane—produces an electric signal in the G-E automatic pilot. This signal is amplified and converted into hydraulic power which moves elevators, ailerons, and the rudder to bring the plane back to its correct position.

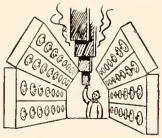


## FLYING SUITS

WHEN planes land in unpopulated regions, or when fliers have to bail out in the middle of nowhere, there is comfort to a General Electric flying suit. Even when not plugged in, the suits can take rugged terrain, strenuous action, and cold weather.

A short time ago some G-E engineers spent two days and nights in the suits on Mt. Cranmore and Mt. Washington in New Hampshire. They skied, hiked, blazed trails, and camped out in heavy snowdrifts at temperatures close to zero.

After the ordeal, men and suits were doing nicely. The men had kept warm; the suits had withstood the wear; and the electric circuits built into the clothing operated perfectly when they were plugged in.



## SPEED DRYING

DRYING time has been cut from six hours to 27 minutes on airplane instrument cases by using the new General Electric infrared Drying Lamps. These lamps are one of the important "little things" that G.E. is manufacturing to speed things up on the production front.

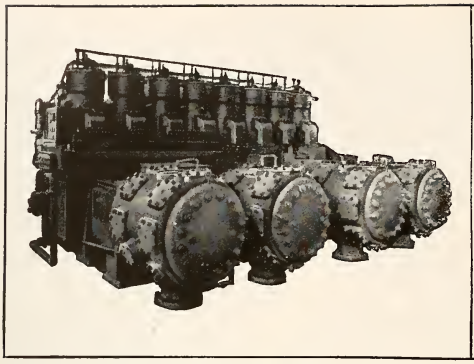
These lamps are being used in many war industries to dry everything from paint on tanks and jeeps to photographic film and the glue on envelope flaps. In addition, some are designed for roving jobs such as drying our important equipment after it has been drenched by floods. Equipment speedily dried is frequently salvaged with little loss. *General Electric Company, Schenectady, New York.*

*Hear the General Electric radio programs: "The G-E All-girl Orchestra" Sunday 10 p.m. EWT, NBC—"The World Today" news, every weekday 6:45 p.m. EWT, CBS.*

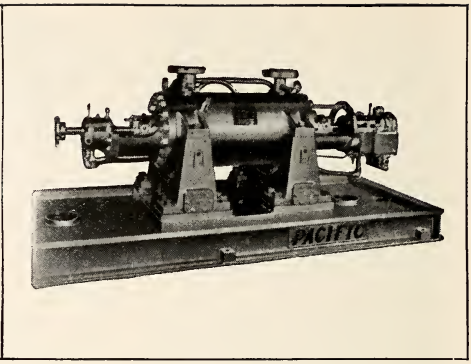
**BUY WAR BONDS**

**GENERAL ELECTRIC**

953-84-211



CLARK 8 Cyl. 800 B. H. P.
GAS ENGINE DRIVEN COMPRESSOR




Pacific Type ITB—Hot Oil, Multi-Stage Horizontal, Forged Steel Shell, Double-Case, High Pressure Centrifugal Pump.

# Achievements in the Field

Half of Clark Bros. 64-year history has been largely devoted to developing and perfecting the "2 Cycle" Engine. Clark engineers, with far-sighted vision, recognized "2 Cycle" as the ultimate engine as long ago as 1910. Years of successful experiment and research produced the modern Clark "2 Cycle."

No greater tribute could be paid Clark for the hard pioneering years, than the wide acceptance Clark "2 Cycle" enjoys today, not only throughout the Petroleum Industry, but in many of the world's largest war industries such as Synthetic Rubber, Synthetic Ammonia and Toluene plants.

Illustrated above is the Clark 8 cylinder—800 B. H. P.—"2 Cycle" Gas Engine Driven Compressor. Because of its notable records in outstanding Recycling and Pressure Maintenance plant, petroleum engineers consider it "standard equipment."

**CLARK BROS. CO., INC.**
**Olean, N. Y.**

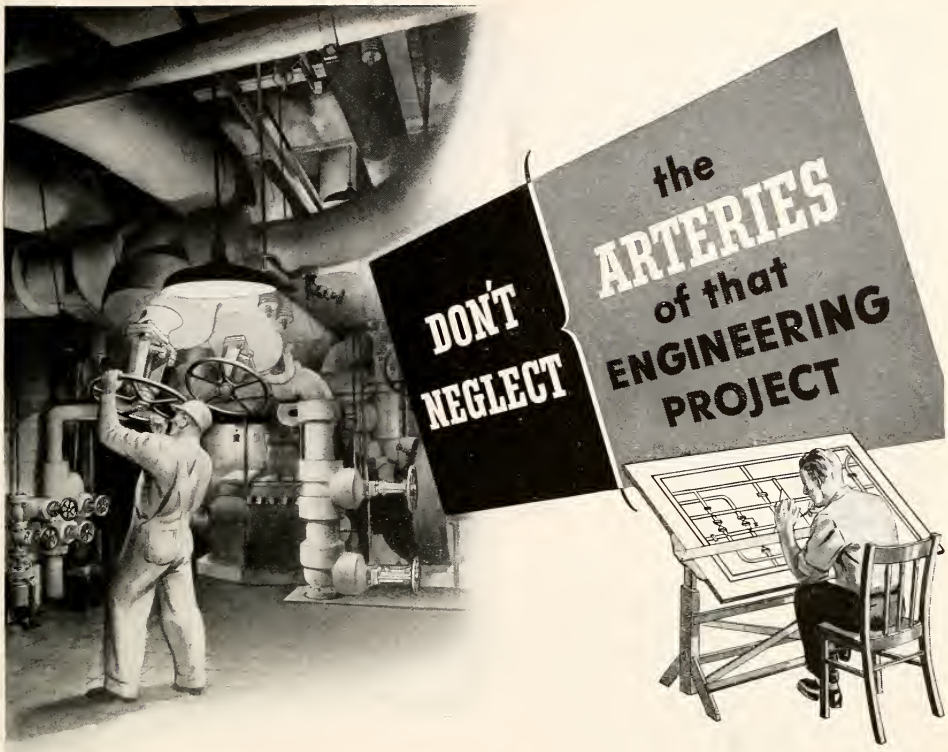
Twenty years ago Pacific Engineers, in a modest little pump shop, startled the world with a radically new oil pumping technique. In those days oil pumps were costly and unreliable. They either ground themselves to uselessness in a few months or corrosion did the trick.

So these alert Pacific engineers took the micrometer, new alloys, finest of materials and developed new engineering methods. They created a group of precision pumps that defied all oil field and refinery pumping conditions—pumps of efficiency and economy with a life measured in years instead of months.

Today—in a large modern plant—Pacific still maintains its leadership with a complete line of centrifugal, turbine and plunger types of precision pumps for water well, oil well, refinery, pipeline, process, boiler feed and hot oil operations, as well as large emulsion pumps for synthetic rubber plants.

**PACIFIC PUMPWORKS**
**5715 Bickett St., Huntington Pk., Cal.**

*"Two of the Dresser Industries"*




PIPING is an important part of almost every engineering project. When you indicate a pipe line on a drawing, think of it in terms of the pipe, the valves, the fittings, the unions, the traps that it will ultimately be translated into. Think of the metals of which it will be made—brass, iron or steel. Consider how it should be assembled—bolted, screwed or welded.

The parts that make up any piping system are many, but it will interest you to know that everything for the complete system is included in the Crane line.

By writing Crane on a piping specification, you are assured that the single source will save valuable time, all down the line. You are also certain that all parts will fit providing simpler assembly. Long, satisfactory operation results from the high quality which, since 1855, has always characterized piping equipment carrying the name Crane.

CRANE CO., 836 S. Michigan Avenue, Chicago 5, Illinois

## HERE'S ENGINEERING DATA TO HELP YOU

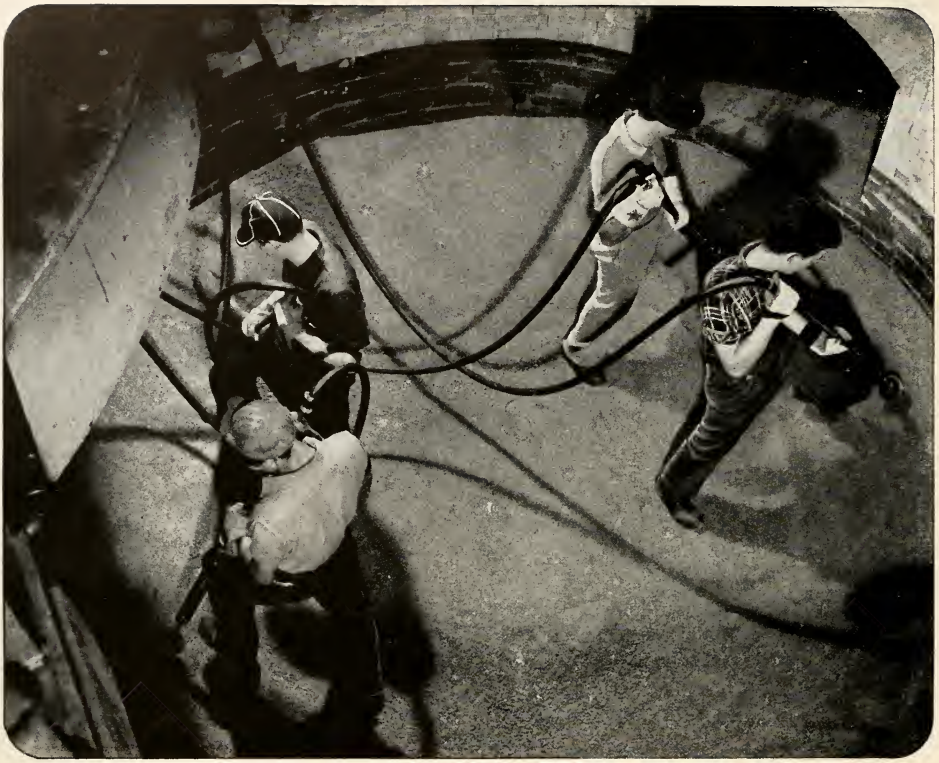



*Crane engineers have prepared several important books and treatises on piping systems. These include the* Crane Catalog, *listing more than 48,000 piping items and containing valuable engineering data—*Piping Pointers Manual, *packed with piping information—*Flow of Fluids *and* Combating Corrosion, *two technical papers. This material is available from the following persons in your school, for reference.*

Prof. Stanton E. Winston, Mech. Engineering
Prof. Harry McCormack, Chemical Engineering
Dean Henry P. Dutton, Industrial Engineering
Prof. J. F. Mangold, Mechanics Department

CRANE

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS



*OWI Photo by Palmer, in an Allegheny Ludlum Plant.*

# ANOTHER *Cooker* FOR THE STEEL BROTH OF WAR

TWO days after the men finished ramming in the bottom of this new 35-ton electric melting furnace, it was in full operation on special alloy steels for the war assembly lines.

Allegheny Ludlum plant capacity has been expanded at record pace. Our output of stainless, electrical, tool, and aircraft engine valve steels has been multiplied again and again. Production will continue to increase, because the appetite of war is insatiable—particularly in this and the coming year, with the effort of the Allied Nations transformed from defense to the attack.

We have been in the fight from the beginning, and will remain until the close. Then, after peace has been regained, we can apply the additional knowledge and capacity accumulated during the war years to the enrichment of your personal life. Allegheny Metal, and our other alloy steel products, will return to their familiar everyday uses and to your homes.

Meanwhile, the appetite of war is also insatiable for many things with which *you* can help, directly and immediately. Collect scrap metal and paper; keep expenditures as low as possible; conserve food, heating fuel, gasoline and rubber. *Above all, buy every last War Bond you can afford.*




**Allegheny Ludlum**
**STEEL CORPORATION**
BRACKENRIDGE, PENNSYLVANIA

W & D A-9318




# *Your Tomorrow Began Yesterday*

Yesterday someone did something that will make tomorrow better.

We do not mean to be Pollyanna. We are totally engaged in the grim business of producing for war. But it is still hard, realistic fact that the good things of tomorrow are being planned today, were planned yesterday. Jobs, for instance. Your future job.

This is one reason why we enjoy working with aluminum. It's full of possibilities for making new things, and making old things better. The future of aluminum is exciting.

There is now much more aluminum and it costs less. It will be usable in many more places. Alcoa has been imagineering in aluminum for 54 years and we have good reason to feel the postwar future of aluminum is something for a man to want to have a part of.

Look what aluminum can do to help patch up this shattered old world. It's the wings of the Air Age. It is going to tie remote peoples together and help bring about understanding.

Aluminum's strength with light weight makes things easier to lift, less expensive to move. It offers another spurt of growth to all forms of transportation.

Alcoa Alloys in brilliant colors promise a new splurge for beauty. Think what you can do to brighten homes and hospitals, stores and schools with a metal that is easy to work, resistant to corrosion, light, strong and capable of being dyed practically any color of the rainbow!

We have seen a lot of good imagination engineered into plans utilizing Alcoa Alloys. We have done some Imagineering of our own, too.

These plans are today's blue-prints for tomorrow's jobs. Many of you younger men will be needed to turn them into action. In fact, we hope some of you will want to help put across the ideas we have been cooking up here at Alcoa.

*A PARENTHETICAL ASIDE: FROM THE AUTOBIOGRAPHY OF*

## ALCOA ALUMINUM

• This message is printed by Aluminum Company of America to help people to understand *what we do* and *what sort of men* make aluminum grow in usefulness.




# A DEPRESSION STRATEGY BECOMES A WAR ASSET

We did not envision war during the depression years when we planned and built a series of giant coal refineries. It was our objective to create a better product economically — to help improve and keep secure the good will by which our business lives.

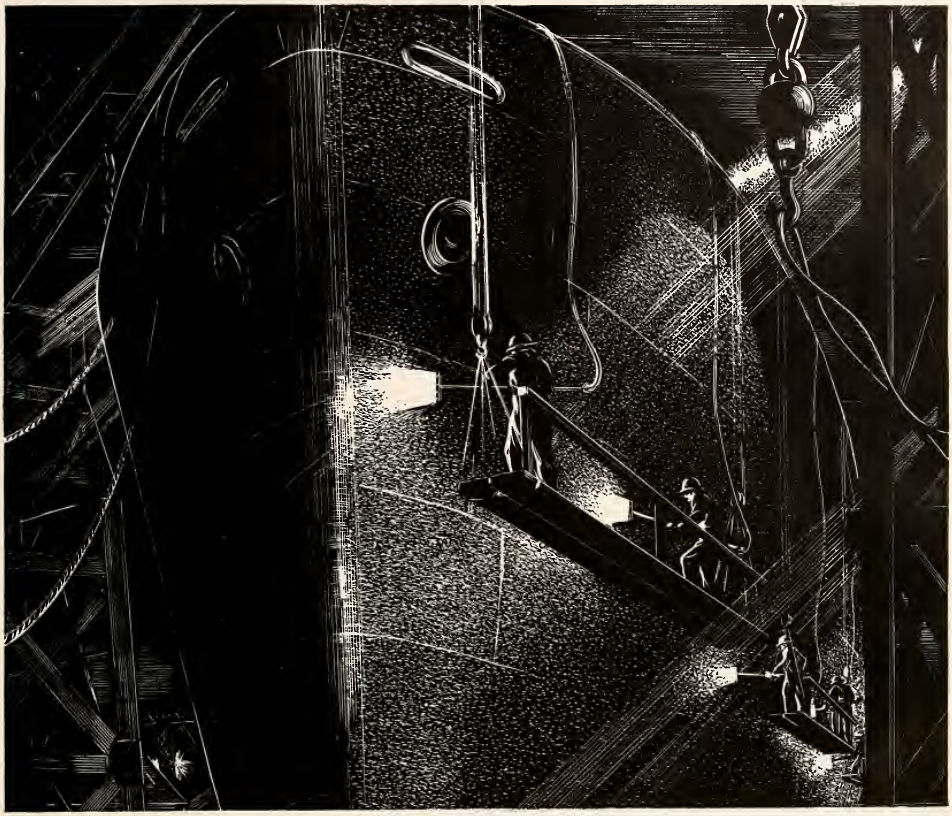
Operating now are six such refineries. With machine-precision they extract non-combustibles from Peabody coal before it is loaded for shipment. These non-combustibles are refined from the coal at a daily rate totaling hundreds of tons — saving the use of railroad equipment for its transport — saving again the use of manpower to handle it from the mines to final disposal in the form of worthless ash.

In its clear contribution to the conservation so vital to today's needs, this peacetime development has in reality become a war asset.

## PEABODY COAL COMPANY

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# Scrubbing Steel Ships with Brushes of Flame

Painting a big modern cargo or troop ship is an expensive and important finishing operation. To assure the longest possible paint life, many large ships are first thoroughly cleaned with "brushes" of oxyacetylene flame — a steel-conditioning treatment that produces a clean, smooth surface unblemished by rust or scale.

Moreover, this modern steel-cleansing method drives occluded moisture from the steel, thus making it more receptive to paint and making paint jobs last longer. As a result, repainting becomes a much less frequent necessity...maintenance costs are considerably reduced.

In addition to cleaning steel, the oxyacetylene flame has many other uses. It cuts metals into any shape quickly...surface hardens them at points of wear... welds them into strong parts. With the electric arc, it constitutes a remarkably fast, versatile metal-fabricating team.

If you would like to receive our informative publication "Airco in the News," we shall be glad to send a free copy. Write to Mr. G. Van Alstyne, Dept. C. P., Air Reduction, 60 East 42nd Street, New York 17, N. Y.

*SEND FOR FREE BOOKLET "AIRCO IN THE NEWS"*

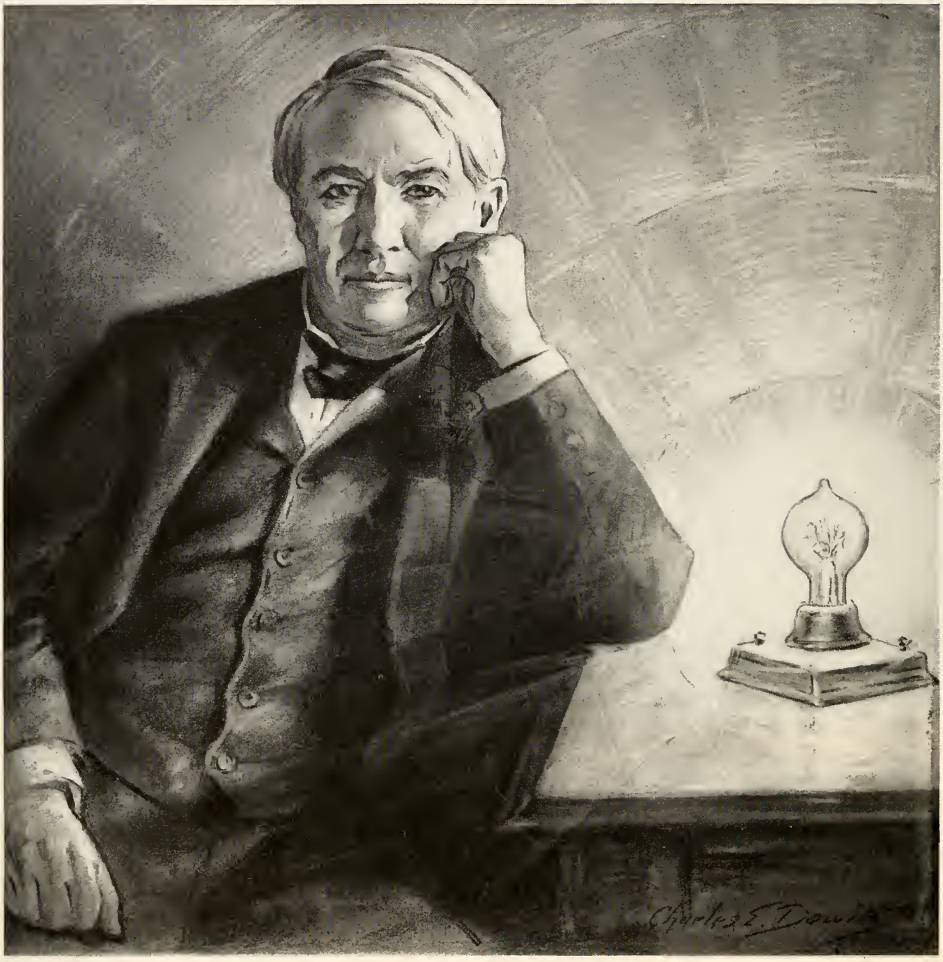
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# THOMAS ALVA EDISON

## Feb. 11, 1847—Oct. 18, 1931



On October 21, 1879, Edison and an assistant, after three days and nights of ceaseless effort and failure, succeeded in carbonizing a piece of cotton thread and accomplished the difficult task of adjusting this fragile thread filament into a glass bulb from which they extracted the air, creating therein a vacuum. An electric current was turned on through the filament and—a beautiful soft light resulted—a new wonder had come forth into the world: It was the birth of the incandescent light!

"In the first breathless minutes," said Edison, "we just sat and watched—we watched with anxiety how long it would last—it lasted forty-five hours; then I said, if it will burn that number of hours now, I know I can make it burn a hundred."

Crowe Name Plate & Manufacturing Company, Chicago

## Contributors

**Roland A. Budenholzer** is assistant professor of mechanical engineering at Illinois Institute of Technology.

**C. O. Dohrenwend** is chairman of engineering mechanics research in the Armour Research Foundation.

**C. R. Glaves** is associate professor of accounting.

**S. I. Hayakawa** is associate professor of English.

**William C. Krathwohl** is director of the department of educational tests and professor of mathematics.

**Sanford B. Meech** is associate professor of English and associate editor of the "Engineer and Alumnus."

**Paul O. Ridings** is director of the News Bureau.

**John J. Schommer** is professor of industrial chemistry, director of athletics, and director of placement.

**Marie Seaberry** is a reporter for the News Bureau.

**Howard P. Vincent** is assistant professor of English. Professor Vincent, a Harvard PHD, came to Illinois Tech from Hillsdale College.

**Bernard Weissman** is assistant athletic director and manager of the Student Union.

**E. Clark Woodward** is director of War Safety Training.

**J. I. Yellott** is director of the Institute of Gas Technology and chairman of the War Training Committee at Illinois Institute of Technology.


# ILLINOIS TECH ENGINEER
AND ALUMNUS

MAY 1944

VOLUME 9 NUMBER 4


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Alumni Section

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# TOPPLING THE TOWER OF BABEL

By

HOWARD P. VINCENT

The sudden shrinking of the world within the last few years has impressed on all but a few minds the inexorable necessity of cooperation on an international scale. "One World" is the new goal toward which we are struggling. To achieve this oneness, our leaders have been thinking in terms of world political federation, an international currency, and, spurred on by Winston Churchill's speech at Harvard last September, an international auxiliary language. At present the most popular candidate for this great international language is *Basic English*. It has been lavishly praised by its supporters, and ignorantly attacked by its opponents. What are the facts about Basic English, and why should it be chosen as the world language?

Granting the need of such a language—and few people will deny it—what are the qualities which it should have? They may be summarized briefly: The world language should above all be simple enough so that it can be learned quickly; it should be on a level to effect communication in everyday business, politics, science, and art; and it should be a language which will command wide acceptance.

You may recall other attempts to invent a language for international communication. The chief of these invented languages is Esperanto, but there are over 250 others supported by small bands of enthusiasts. Many of these languages are extremely logical, that is, they build from simple elements to more complex units so that they have eliminated most of the difficulties of language such as case endings and conjugations. But there is one inescapable drawback to such inventions—they are "artificial" languages; they are inorganic and not organic. This, it seems to me, is a subtle but profound objection. There are still other drawbacks to these manufactured languages; they are rather difficult to learn (it has been estimated that one needs 750 hours to learn Esperanto, and, having learned it, one has but a few people to speak it to!), and they are the sacred cows of small bands of enthusiasts, so much so that hardheaded critics have labelled them "crackpot," an indicated attitude which would be difficult to overcome.

If the "artificial" languages do not meet the requirements for a world language, then what about the present "natural" languages, especially those already spoken by large groups of people? Is any one of them sufficiently simple so that it can be learned effectively by a normally intelligent person within, let us say, three months time? Our memories of struggles with French and German in college make us answer "No"—emphatically. Foreigners would say the same for English, although, indeed, before the war, English, was taught as a secondary language in many countries in Europe.

But if one of them is capable of being concentrated and simplified to such an extent that it can be learned in fifty hours, then it should serve as the second language of all nations. Furthermore, if we find that the language capable of such simplification is in its expanded form the most widely spoken language in the world, that it is the language of two great allies of this war, our search is at an end. This is the English language as put in Basic form.

Basic English is a language developed in 1929 out of ordinary English by Professor C. K. Ogden, a psychologist at Cambridge University, England. It is a selection of 850 normal English words intended to meet those needs of everyday life for which the larger vocabulary is ordinarily employed. Mr. Ogden selected these 850 words according to three criteria: (1) how frequently they were used, (2) in how many ways they could be used, and (3) how hard it would be to put them into other words. What was left after his threefold screening was this group of words, which, it is argued and demonstrated, can do all the work, although not so gracefully, as the larger, normal word-hoard. The words are divided into four main groups: (1) 200 names of picturable objects *(knee, knot, leaf, leg);* (2) 400 general things or abstract nouns *(payment, profit, crime, agreement);* (3) 150 qualifiers *(fat, free, good, great);* and (4) 100 words denoting operations, such as the verbs and prepositions. The greatest and most amazing reduction in vocabulary was achieved by Ogden when, following Jeremy Bentham's suggestion of getting rid of verbs, he discovered that by employing sixteen simple verbs ("operators", he called them) and two auxiliaries he could drop the entire complicated English system of verbs, perhaps the greatest stumbling block encountered by foreigners learning our language. These simple operators — simple but powerful! — are: *come, get, give, go, keep, let, make, put, seem, take, be, do, have, say, see, send, may,* and *will.* When we use these in place of the ordinary verbs we eliminate over five thousand verbs without losing our ability to express ideas. For instance, we use *abandon, abdicate, cede, desert, desist, disuse, forsake, relinquish, renounce, resign, surrender, vacate, withdraw,* but in the Basic combination *give up* we have an adequate substitute for any one of them.

What about rules? *Basic English* has only six simple rules, easily

memorized in an hour: (1) noun plurals in *-s;* (2) derivatives in *-er, -ing, -ed,* from 300 nouns; (3) adverbs in *-ly* from qualifiers (4) degree with *more* and *most;* (5) operators and pronouns conjugated in full; (6) measurements, numerals, and currency, calendar, and international terms in English form.

For professional people: doctors, chemists, biologists, engineers, etc., there is an added Basic vocabulary which brings the word total up to 1000 words. As a sample of what can be done in science, the following passage from Professor H. Levy's article on the "Mathematical Problem of Acrodynamics."

> The equations governing the motion of a viscuous fluid were first obtained by Navier more than one hundred years ago, and in spite of their close study by Stokes, Helmholtz, Kelvin and numerous other mathematicians of great eminence, no complete unrestricted solution for any case of practical importance has yet been discovered,

has been put into Basic English as follows:

> The equations controlling the motion of liquid or gas mediums having "viscosity" were first given by Navier more than 100 years back, and though they were gone into in detail by Stokes, Helmholtz, Kelvin and a number of other great authorities in mathematics no discovery was made of a complete solution — unlimited in range — which was of much use.

The complete language could be legibly printed on a single page of the *Illinois Tech Engineer and Alumnus.* Through pictorial charts and phonograph records foreigners can learn Basic English in between thirty and fifty hours. It has received the enthusiastic support of leaders like H. G. Wells, George Bernard Shaw, Madame Litvinov, and, of course, Winston Churchill. Before the war it was being taught in Russia, Denmark, Japan, and China. At present, lessons in Basic English are going out daily, from Station WRUL in Boston, beamed at foreign listeners. One of the most fertile fields for the spread of Basic English is South America, already receptive to our language because of the influence of Hollywood. And, it should be added that Walt Disney has produced a Basic English short!

Naturally such a new idea as Basic English has met with considerable resistance. Some have charged Basic English with "cultural imperialism", and, if the charge were true, it would be sufficient ground for its abandonment. Any other language, French or Spanish, let us say, would be equally guilty of such a charge. The people who have reason to fear this cultural imperialism, however, — the Chinese, the Indians, the Russians, the South Americans—have in their realistic knowledge of the need for a world language been quite receptive to Basic English. They realize what the critics overlook, that Basic English is not an attempt to supplant the language of any other country; it is a second language for purposes of international communication.

Then the critics ask, why not some other Basic tongue, a Basic German or a Basic Greek, let us say. The answer is that no other great language, except Chinese, is simple enough in its normal structure to take such a condensed reduction to 850 words without a tremendous loss in power. For instance, a Basic Spanish with effectiveness equal to that of Basic English would require a vocabulary of 2000 words and a complex set of rules. Although Chinese reduces readily to 850 words, there are other difficulties about that language which would extend the learning time far beyond that of Basic English.

Third, the opponents argue that Basic English is not a literary language, that much of the beauty, the variety, the shadow (connotation) of ordinary English has evaporated in Basic. That is true. Basic does not pretend to have the subtlety and charm of full English; such an expectation would be fantastic, especially because of the loss of the verbs. Verbs are picturesque and active,—but remember also that they are unpredictable and varying, and to allow a foreigner to use them before he has learned the simpler words is like allowing the baby to play with ration stamps before he has learned their significance. Anyone will concede that Basic is more awkward than ordinary English, but it is decidedly not so bad as its opponents describe it to be. BAD BASIC IS BAD ENGLISH is an inflexible law in Basic criticism. Following is an example of "regular" English not uncommon in professional circles, "The apperception of self-motivation is a psychological fact. A concomitant phenomenon is the consciousness that the origin of this motivation is internal and not external." When a professor talks like that, one blames the speaker and not the language. He might have said in good Basic English: "The mind is conscious that it is self-moving; and, at the same time, that the motion comes from inside itself, not from outside." Though some normal English which we read is awkward or incomprehensible, we do not insist that the English language be thrown into the ashcan—and the same goes for Basic English. A recent writer in *Harper's Magazine* attacked Basic English by making up a lot of bad sentences in Basic and charging them against the language instead of against the creator of the sentences. Such misdirected criticism simply invalidates itself.

Many of us are not so very far from Basic English in our ordinary usage. Aside from our employment of a large number of verbs, we tend to use a general pattern of Basic English, especially when we follow the very sensible Basic requirement of a word order of subject-verb-object. Pick up your newspaper and you will find paragraphs of almost pure Basic English. The following paragraph from Carl Sandburg's writing is, save for two or three words, in Basic English:

> What did Lincoln do then—when he was alive and had many of the powers of a dictator? That, too, is a question. Often nobody but himself knew beforehand what he was going to do. And when he did it, what happened? Take a look back and see what happened. We have a right to say there were times when what he did looked wrong to good men then.

International books such as the Bible are easily translated into Basic. Three verses from the first chapter of *Genesis* are a good sample:

> (1) First God made the Heaven and the earth, (2) And the earth was without form, and there was nothing in it; and the dark was upon the face of the deep. And the spirit of God was moving over the face of the water, (3) And God said, "Let there be light in the sky of the Heaven to make a division between the day and the night."

For that matter, aside from the words "cupboard" and "bare" the Mother Goose favorite about old Mother Hubbard is in Basic English!

The necessity for international communication, for an international auxiliary language, is great. The disadvantages usually charged against Basic English are invalid; the advantage are many. What are we waiting for then? We wait for the public to become conscious of this new linguistic development, and, becoming aware, to give it their support in every way; for the United States Government to recognize the place of Basic English in the same way that Britain has done. The growth of Basic English has been rapid, and it should accelerate.

We can do our bit for international understanding by supporting the movement for a world language. At the present moment, Basic English seems to be the most logical choice.

# PHYSICAL TRAINING AT ILLINOIS TECH

By

BERNARD WEISSMAN

Several athletic programs have been in progress at Illinois Institute of Technology, all under the supervision and direction of John J. Schommer, Athletic Director. First and of most importance is the Navy Physical Fitness Program, operated for two groups—one at Illinois Tech of about 400 students, and the other at George Williams College of about 300 students. On the Armour Campus, the Navy personnel working directly with the Navy V-12 Program is comprised of Ensign Edward Glancy, Athletic Officer; Chief Fred Godfrey; Chief Emmett Jamieson; Specialist Carl Mueller; and Specialist Cecil Richards. These men are aided by two civilians of the physical education department of the Institute: Grant Stenger and myself. The program for the Navy V-12 men at George Williams also comes under the direction of Ensign Edward Glancy as Athletic Officer of the whole unit. He is aided in running the program at George Williams by Navy men Chief Hiram Fearey and Chief Roy Wayne Burkhart, as well as by three civilians from the George Williams athletic staff: Dave Misner, Paul Dunsing, and Walter Zimmerman.

The program next in importance was the Army Specialized Training Program, wherein four civilian instructors carried out the program as directed by the Army. These men were Merritt Cook, Bud Bol, Ernest Useman, and George Sonnenleiter. They administered the Physical Training Program of about 500 men. On March 17th the A.S.T.P. Unit was discontinued.

The civilian physical training and intramural program is carried on at the Lewis Campus under the direction of John Dolce and the Lewis intramural manager, with an average of about 100 students taking physical training at least twice a week. The civilian students on the Armour Campus fit into the Navy physical education classes wherever it is possible for them to do so, and compulsory physical education of at least two periods per week is enforced for the freshmen students of the Institute.

Illinois Institute of Technology in the past year made rapid progress and definite changes in its physical training program in order to train its students for the armed forces. Its program as a whole could be considered as being divided into three phases: intramural activities, varsity sports, and the physical fitness training programs as requested by the Army and Navy personnel and administered by the Institute.

## INTRAMURAL ACTIVITIES

Our intramural program since November '43 has had the following activities: touchball, basketball, and bowling.

TOUCHBALL. In our touchball tournament approximately ten teams representing the separate classes and groups of the institute have participated. Because of uncertain weather conditions, the tournament was suspended in December with three teams still in the running: the Senior Mechs, Junior Civils, and Sophomore Mechs. This tournament will be completed as soon as the weather and ground conditions favor at least two more games being played on Ogden Field. The interest and rivalry shown in our touchball games have added greatly to the competitive spirit of the students at the Institute. They have been great favorites because of the actual body contact of persons participating in the games. It has seemed that the rougher and more rapid the sport, the more natural interest the students take.

BASKETBALL. Our basketball tournament drew an entry list of fifteen teams. This tournament was played in our gym on the fifth floor of the Main Building, and the caliber of competition is indicated by the score of the final and championship game, which was won by the Junior Chems over the Junior Electricals by a score of 80 to 75 after two overtime periods. This game was, beyond a doubt, one of the most exciting and interesting intramural basketball games in the history of the Institute. It not only set a record for high scoring, but for total high

The Jumping-jack



score of two evenly matched teams.

BOWLING. The bowling tournament drew an entry list of eight squads, and the Senior Chems emerged victors after a process of elimination contests wherein each team had to lose at least two matches before it was eliminated. A high game medal and a high series medal were awarded to the top individuals participating in this tournament. They were won by A/S Bill Parks, Senior Civil, with a high game of 238, and Al Petronis, Senior Chem, with a high series of 640—both very commendable scores for any type of collegiate competition in bowling.

During the winter months the boxing and wrestling intramural tournaments were not held because there was no time available for use of the gym. We hope that these intramural tournaments can be held during the spring semester, and every effort will be made to hold them.

Some of the activities scheduled for our intramural program during the spring and summer are as follows: swimming, tennis, golf, soft ball, horse shoes, and ping pong. These sports will most likely be run off in very short order, one tournament following the other, so that there will be no lull in the intramural program.

Credit is due to our intramural manager, Cliff Oliver, a Senior Chemical, who graduated in February '44, for his remarkable ability in handling the intramural program for the past three semesters. I wish to take this opportunity to compliment him on his successful management of the program as outlined.

## VARSITY SPORTS

In November '43 the following varsity sports were organized for the winter term: basketball, boxing, wrestling, and swimming.

BASKETBALL. The team this year, under the direction of Coach Ed Wagner, compiled the most sensational record of any basketball team since 1898, winning sixteen and losing two. Some of the teams beaten this year were North Central, Navy Pier, University of Chicago, University of Chicago Navy Radio, George Williams, Northwestern Navy. The squad was made up of seven Navy V-12 men and nine civilians. Coach Ed Wagner presented his squad with eleven major letters and five minor letters.

BOXING AND WRESTLING. The wrestling team completed a record of five wins and one loss. Among the teams defeated were Wheaton College, Navy Pier, and George Williams. Being decisively defeated by Navy Pier by a score of 25 to 2 and then turning the tables on them to win in a return match was the highlight of the season. Illinois Tech had failed to win a match from Wheaton College in seven years; to beat them in two matches in one season was a bit more than was expected. Two matches were also won from George Williams College. George Williams housed our first-year men in the Navy V-12 program, many of whom will become a part of the Armour Campus V-12 group before another season rolls around. Its team had an enviable record this year also.

The boxing squad had one meet with Navy Pier, which they lost by a score of 6 to 1. Eight men were entered in the Golden Gloves tournament, and the total of bouts for the boxing team was seventeen.

Most of the success of the wrestling team can be attributed to the Navy physical fitness program here on the Illinois Tech Campus. Condition is about 90% of success in wrestling, and a high degree of physical fitness (which I shall explain later in my discussion of the Navy Physical Fitness Program) contributed greatly to our success. At the end of the boxing and wrestling season, eight major letters and eight minor letters were awarded to the men who had comprised the squad.

SWIMMING. The team compiled a record of two wins and four losses under Coach Ed McGillivrey. Home and home meets were with the University of Western Michigan, the University of Illinois, and George Williams College. The swimming team had very few veterans and worked under a handicap all during the season by having to travel to the University of Chicago for their practice sessions. Most of this squad was made up of Navy V-12 men. Arranging its schedule was one of the greatest difficulties the swimming team had, because by order of the Commandant of the Navy V-12 program they were not allowed to travel outside a 75-mile area (as the boys could not spare too much time away from their studies) and because several of their former rivals had abandoned swimming competition for the duration. At the end of the season, Coach McGillivrey awarded seven major letters and five minor letters to a squad which was well deserving of this honor.



The Squat-jump

## PHYSICAL FITNESS TRAINING PROGRAM FOR THE ARMED FORCES

Under the direction of the Army and Navy personnel, a set group of physical fitness exercises has become the basis for all of our athletic activity and strength tests. The exercises are the squat-thrusts, sit-ups, push-ups, squat-jumps, and pull-ups. In addition to these five, the Army Unit also uses two other basic exercises called the 100-yard pick-a-back and the 300-yard run. I shall attempt to describe these exercises for you, so that in case you are inclined to try them, you may do so. Also, a description of them will enable readers to get a better understanding of what has been expected of the ASTP and the Navy V-12 students on the campus.

SQUAT-THRUSTS. To measure agility, speed, and coordination. This particular exercise is started from a standing position. The hands are placed on the floor within the vicinity of the feet, and the legs are extended backward. The latter are immediately returned to a squatting position, after which the position of attention is again assumed. This movement is repeated as often as possible within a period of one minute. The greater the number of times a person can complete this exercise, the higher his score under the tabulation of the efficiency test.

The four following exercises are all completed to a point of exhaustion or fatigue.

SIT-UPS. To measure abdominal strength. The individual starts from the position in which he is flat on his back, hands clasped under his head, knees straight, and feet about one foot apart. Another individual holds his ankles as he sits up and touches his left elbow to his right knee and then reverts to his original position flat on his back, sits up again and touches his right elbow to his left knee. (Illinois Tech record: Navy V-12—1269; ASTP—1358.)

PUSH-UPS. To measure arm and shoulder extension strength. This exercise is executed from a front lying rest position. One push-up is scored each time the individual lowers his chest to the floor and pushes up to his original position.

SQUAT-JUMPS. To measure leg strength and coordination of the body and arms. The fingers are locked and placed on the top of the head. The toe of either the right or the left foot is placed at the heel of the opposite foot. The feet should be separated by about six inches. The individual performing this exercise jumps upward from the squatting position, reversing the position of his feet, and comes down to a squatting position again. This exercise is repeated immediately with the position of the feet being reversed at each jump.

PULL-UPS. To measure arm and shoulder strength. The contestant with arms extended reaches a bar about eight feet from the floor. He pulls his weight up to a point where his chin is above the bar, then lets himself down to the full length of his arms once again, and repeats this performance.

The score an individual makes on these last four tests is judged by the number of complete movements or exercises he can accomplish without stopping.

The two additional Army Unit exercises, mentioned earlier, complete the list of physical fitness tests. The one is the 100-yard pick-a-back against time, which measures muscular endurance. It requires carrying an individual 100 yards in a rider's position on the contestant's back. The other exercise is the 300-yard run, which measures cardio-respiratory endurance and is also completed against time. The less time it takes to run these two events, the higher the score recorded for the contestant.

In the Navy Physical Fitness program for our Navy V-12 students, there are two divisions: basic and maintenance. In order to get out of the basic training and into the maintenance program, which is the advanced program, an individual must score an average of 50 points. The above events are tabulated on a scoring basis, and, in order to obtain a mark of 50, a man would have to do the following number of exercises for an average count of 50: he must do 29 squat-thrusts in a minute, and do 36 sit-ups, 28 push-ups, 34 squat-jumps, and 9 pull-ups on a horizontal bar. The two Army running events would have to be completed as follows: the 100-yard pick-a-back in 26 seconds, and the 300-yard run in 46 seconds.

These exercises have been performed under the supervision and watchful eye of the physical education personnel in both the Army and Navy programs. In exercises which are not done correctly, points are counted against the contestants.

It is suggested that some of our readers take this opportunity to try the above exercises as outlined, to find out how physically fit they really are (not).

Our civilian students have benefited immensely by the above regulated tests, as they fit into the Navy classes whenever a vacancy exists. You must remember that all persons taking these tests are persons who have had very little physical exercise before getting into the various Army and Navy programs.

Both the Army and Navy have given these examinations in the second week of the semester; and then the Army has given them again in the twelfth week, the last week of the Army's semester, while the Navy has given them in the seventh week and in the fifteenth week, which is the next to the last week of the Navy's semester. The program for the Navy requires one hour per day, five days per week of physical exercise, including one hour per week of swimming for swimmers and three hours per week of swimming for non-swimmers. The sixth hour as required in the regulations is a drill period, usually on Saturday morning. The Army program as given here at the Institute required two hours per day, three days per week, with a one-hour period of swimming inclusive. So much for the physical fitness tests as given by the Army and Navy.

Basic physical training is required of all first semester men and of all those who do not attain an average of 50 in the physical fitness test. It has the following set-up: From the first through the eighth week, there is a period of general conditioning. The activities here at the Institute include calisthenics, swimming, running, tumbling, rope climbing, jog marching, and relays. From the ninth through the sixteenth week, the program includes combatives and general conditioning. Fundamental instruction in basic includes rope skipping, bag punching, and wrestling.

The maintenance program runs straight through the sixteen week semester and includes calisthenics, running, and organized competitive seasonal sports. The standard sports are swimming, touch football, soccer, basketball, soft ball, boxing, wrestling, track, volley ball, and the usual one hour of swimming for swimmers and three hours of swimming for non-swimmers during the week. The men in the Navy Unit who compete on varsity squads and in intercollegiate competition are excused from the physical fitness program. They are not excused, however, from swimming or the daily morning calisthenics of twenty minutes.

In the three semesters that the Navy Unit has been here at the Institute, the average grade for the unit as a whole has gone up steadily. The first semester, the average was 53.4; the second semester, it was 62.7; and the first test given in the third semester shows an average at the present time of 64.4. (Highest individual score—90; lowest—33.)

Our Navy V-12 program has been progressing rapidly, as far as the physical fitness of the students is concerned, and we may attribute the success of our varsity sports to the fact that our students at the present time are in better physical condition than any other group of men who have ever been students at the Institute. I do hope and believe that what progress we have shown on the programs as set forth we may be able to carry on in civilian life after the big struggle is over. At least it would be a move in the right direction. I do not believe that a let down after the Navy program has come to an end at the school will be in order at any time. Physical fitness has shown itself to be of vast importance not alone to the armed services but also to the welfare of the students, and ever to go

(Turn to page 40)

# THE IMPORTANCE OF BUSINESS SUBJECTS IN THE ENGINEERING CURRICULUM

By

C. R. GLAVES

It is assumed in this article that engineering is a profession, not a vocation. Although it is sometimes difficult to differentiate between the two concepts, it can be said safely that the true professional engineer understands the business, as a whole, of which he is a part, albeit he is a specialist in only one branch. He may have no desire to be an accountant, but he should be able to read financial statements; he has to understand labor problems and psychology because he must work with people; and he must be acquainted with the theory of international trade, taxation, money and banking, and constitutional law, because they affect vitally the concern with which he is connected.

What are business subjects? Again, there is no definite answer, but the writer believes strongly, as suggested above, that the professional engineer should understand the fundamentals of economics, accounting, personnel administration, financial administration, constitutional law, business law, production, marketing, statistics, psychology, and business organization. Perhaps the reader will conclude that a careful study of the above mentioned subjects would leave little time for the study of engineering. If the business subjects are taught by faculty members who are specialists in their respective fields and with the same degree of thoroughness that the engineering faculty requires, thirty to forty college hours of credit will be sufficient to accomplish the desired results. If these subjects, however, are merely added to those already required in a four year course, the results will not be satisfactory. The addition of the business subjects will necessitate either a decrease in engineering ones or the extension of the engineering program, as a whole, to a five year period. Make no mistake about it; the teachers, however expert they may be in their fields and however skilled in verbal calisthenics, cannot educate the students in business. Hard work by the latter is a necessity.

In talking to engineering students, the writer has learned that many of them are ambitious to become business executives. This is a thoroughly legitimate ambition. Also, it seems logical to conclude that it is a very possible one to attain since their engineering study is objective. Successful business executives are tireless workers. But engineering graduates have had to work hard. Some of them are naturally energetic; others have acquired the energy necessary in order to complete their school programs. Normal or better than normal native ability, an objective approach, a willingness to really work; what a combination!

Then why does the engineer need a knowledge of business subjects? In order to become a successful executive, he must understand the economic organization of his concern, of his country, and of the world. In studying economics, the student learns to make hypothetical assumptions regarding economic phenomena and the institutional situations in which they exist. Engineering students frequently show little interest in such assumptions and seem to think they should be studying facts at all times. But any successful executive will tell them that it is absolutely necessary to use deductive reasoning, although a thorough knowledge of existing conditions is also necessary. Tax laws, labor laws, tariff laws, etc. may be changed. If they are changed, new managerial decisions must be made. Consequently, hypothetical assumptions must be drawn, deductive reasoning must be used. Economic theory is intended to train the mind and to aid the student in thinking and reasoning. The students educated in economics may forget many facts presented to them, but they should never forget the methods used in analysis. J. M. Keynes has said that: "The theory of economics does not furnish a body of settled conclusions immediately applicable to policy. It is a method rather than a doctrine, an apparatus of the mind, a technique of thinking, which helps its possessor to draw correct conclusions."

Why should engineers understand accounting fundamentals? Accounting is a tool which the executive must use, although he may hire bookkeepers and accountants to "keep" the books and prepare the financial reports. No productive agent used in business can be considered costless. Net profit is the excess of gross income over the costs of securing that income. Therefore, a continuous study of incomes and costs must be made. Students frequently remark that the executive hires this work done for him. It is true that the details are performed by hired employees, but who makes managerial decisions based upon such detailed reports? How can the owner or hired administrator make them unless he is acquainted with the fundamentals of accounting, especially financial statements? Obviously, he can't. Recently, a consulting engineer presented to me a simple case which he had just solved for the president of a Chicago company. The company had under consideration the discontinuation of the manufacture of one of its products because the selling price was less than average cost. But the selling price was more than marginal cost. The consultant, with

some difficulty, proved to the executive that the concern's net profit would be decreased if the product in question were not produced. A simple knowledge on the part of the executive of average and marginal costs would have made the decision easy. Of course, if the funds of the concern had been needed for more profitable lines, it would have been advisable to cease the manufacture of the product. But this was not true. In this case, the difficulty arose because the accountants of the company were prorating the so-called fixed costs over the total number of units produced, even though those fixed costs were "sunk", that is, the total fixed costs were the same, regardless of the number of units produced. The consultant was correct. Business executives should understand the economics of overhead costs; this means that the fundamentals of both economics and accounting must be understood in order to make important decisions. Working capital position, dividend policies, production policies, trading on the equity, and many other difficult decisions demand the use of accounts. Remember that accounts should not be kept for the sake of keeping them, but to be used by management.

Engineers, aspiring to become executives, should understand production methods. The problem mentioned above is really a production one, solved by the aid of accounting and economics. The cost of using a certain machine is another problem which can be solved by the statistical method. Often a machine is still very good physically, but has become obsolete because of new inventions. It is then advisable to ascertain the cost per unit of using both the old machine and the new one. Regardless of the fact that the old machine may be as good as ever physically, it might pay to dispose of it and buy the new one. Such questions can be studied and solved in business policy courses.

The statistical approach to business problems has been mentioned in the preceding paragraphs. A course in statistics, for engineering students who have had the required mathematics, is essentially a course in the use of statistical data. Among such studies that can be made is that of quality control. Also, trend lines, standard deviations, standard errors of estimate, various averages, index numbers, etc. can be studied effectively in class and used in business. One of the students in the statistics class the past semester has been using his statistical knowledge in analyzing data for the president of the corporation for which he is working.

Under the conditions of modern society, the connections between business and manufacturing organizations on the one hand and governmental organizations on the other are very close indeed. Each decision a business concern makes, each contract it enters into with customers or employees must be made with due regard to the governmental and legal regulations which govern it. Wartime regulations of the past two years have brought this home to every businessman and production engineer, but the "rules of the game" which government and law enforce are of equal importance in time of peace. It is neither necessary nor desirable that every engineer be a lawyer, but it is certainly essential that any engineer who wishes to occupy a responsible managerial position in his profession must know enough about the basic, elementary concepts of governmental organization and operation to talk intelligently and work intelligently with his firm's legal staff. If the profession of engineering is to exercise the degree of civic leadership in our democracy which the number and education of its members justify, it is imperative that engineers become as familiar with the fundamentals of our governmental and economic institutions as have the other professional men who have exercised that leadership in the past. The fact that only one engineer has been President of the United States appears to be no accident when we consider the small part that training in government has played in the engineering curriculum of the past. So it seems quite logical to say that the engineering students should study business law and constitutional law.

Gerstenberg, an authority on business finance, states that many businesses whose production and sales policies are excellent fail because they are not financed properly. The raising of capital and the using of capital are difficult problems for the businessman to solve. Such problems can be studied in class, since books and articles by men such as Gerstenberg and Lincoln are available. This is especially true if the teacher has had practical experience.

The present age has been spoken of, at times, as "the age of distribution." This indicates the importance of marketing problems as contrasted with purely production ones in industrial management. Industry wants its engineers, even those engaged in design and production work, to be sufficiently cognizant of marketing problems so that their work will conform to the general industrial objective. This objective is to produce something desired by consumers or other producers at such a price and in such a form and on such terms that the potential users will buy it. The many engineers who get into positions of major managerial responsibility will find they are giving a large portion of their attention to market analysis and sales. In courses in marketing, a student becomes acquainted with procedures for market analysis with reference to the product, the buyers, and the competitors; and also, with established principles of sales organization and management.

Should prospective engineers, who have no desire to become business executives, become acquainted with the fundamental principles of business discussed previously in this article? The answer seems to be yes, for various reasons. First, college graduates frequently discover, after going out into the world, that they have natural abilities of which they were unaware. They cannot be too sure that they are or are not going to do a certain thing. In the second place, engineering students, who at the time of their training are not interested in administrative work, will later learn that they can make the greatest contribution and are able to cooperate most fully with those in administrative positions only after they have familiarized themselves with the fundamental principles of business.

If the engineer is to meet the responsibilities of citizenship he must have this broad training discussed previously. Consider some of the topics studied in economics. Commercial banking seems to be a puzzle to adults as well as to younger people; to people with college degrees as well as to those who are not college graduates. The relation between bank credit expansion and business cycles should be understood by all adults. The writer has found adults practically devoid of knowledge of the economic effects of tariffs. College graduates with advanced degrees are no exception. The argument that "protective tariffs cause high wages" is accepted per se; the argument that "a country should be self-sufficient" also sounds good to many people. Of course, both arguments are fallacious. Few people understand simple principles of taxation, especially the incidence of taxes. Recently, a business executive stated to me that he believed "a federal sales tax would prove to be the fairest tax for all since such a tax is based upon benefits received." His honesty should not be questioned, but his judgment must be. Business monopolies cause a decrease in production and employment. Members of labor unions object to such monopolies; they should. But

(Turn to page 40)

# WAR TRAINING FOR WOMEN

By

PAUL O. RIDINGS and MARIE SEABERRY

Time: Eight o'clock on the morning of any weekday. Through staid halls hurry what is probably one of the most unusual groups of women to study at a college. Ranging in age from eighteen to fifty-two, they have been housewives, stenographers, saleswomen, teachers, draftsmen—representatives of virtually all the myriad occupations in which American women earn their living. They have come from every economic and social strata and almost every major racial and religious group in these United States.

Despite their diversity in age, background and calling, these women are engaged in a single major occupation —war.

On their arms they carry books on chemistry, mathematics, drafting, metallurgy, and other highly technical subjects. Their purpose is to equip themselves for a strategic place in America's "army behind the army" and to become as good soldiers in the factories of the nation as their men have proved themselves on the battlefronts.

Such has been the drama which has been enacted for the past two years on the west campus of Illinois Institute of Technology. The women have been studying in the Institute's full-time program of tuition-free war training for women. They have been preparing to replace men on the industrial front, and Illinois Tech has made a vital contribution to the war effort by training 1083 of these women for war jobs.

The program is now nearing its completion—only a handful of women are now studying, whereas at one time the group numbered in the hundreds. But long to be remembered is the unique chapter of educational history which these women and the Institute co-authored in doing their bit to hasten victory.

Illinois Tech's war training for women program is the patriarch of its kind. Established in March, 1942, it was the first program in the nation designed to train women for specific, technical war jobs.

Unique in the intensive education in matters technological which it has given to women, it was the logical outgrowth of the ESMWT (short for Engineering, Science and Management War Training) program, which the U. S. Office of Education has been underwriting at Illinois Tech since December, 1940—plus the high-pressure demand for women technicians in war industry.

ESMWT is a nation-wide program. It was set up by the government to provide free and adequate short-term training in technical fields where shortages of manpower existed, and has operated principally through the nation's engineering colleges. Some form of free training under this program is being given in every state in the union.

It is not surprising that Illinois Tech blazed the trail for women in this free training, for the Institute has been a leader in the ESMWT program ever since its establishment. Even before the women's courses were opened, Illinois Tech had turned out 15,000 technicians, making its war-training program the largest in a single city and the largest at any privately-operated school in the nation.

After Pearl Harbor, Illinois Tech officials anticipated the fact that men were not going to meet the nation's demand for technicians—not by a

Student metallurgical technician





Student chemist and student draftsman



long shot. Measuring the speed with which they had been able to train men against the rapidly accelerating demand for war workers in sub-professional categories, they confronted leaders of Midwest war industry with the then revolutionary proposal of training women as war plant technicians. The response was, perhaps, more on the skeptical than the enthusiastic side. Still, it was sufficiently encouraging to warrant the launching of "pilot" courses by Illinois Tech officials to test whether theirs or any other program dedicated to the building of a feminine technical "army" could prove itself.

Thus it came to pass that on March 9, 1942, Illinois Tech opened America's first free technical war courses for women. Three basic fields—ordnance inspection, engineering drafting and industrial chemistry—made up this "pilot" program. Metallurgical techniques began to be offered in October, 1942; engineering fundamentals, in February, 1943; and industrial engineering, "baby" of the program, in May, 1943.

Three hundred and fifty women applied for entrance to the "pilot" courses, maximum enrollment in which had been fixed at one hundred and thirty-five. Entrance requirements were comparatively high. In addition to a general high school education, applicants were required to have one year of physics and one-half year of trigonometry. Later, the demand for women technicians grew so rapidly that requirements were twice revised downward.

Today any woman who is a high school graduate is eligible. Only specific requirements surviving are the seemingly indispensable ones which provide the background for each course. In industrial drafting, for example, it is evidence of ability to draw, plus some mathematics. In both chemistry and metallurgical techniques, it is high school or college chemistry.

Long before the conclusion of the "pilot" program, the combined clamor of war industries, the government, and war-minded American women had forced the opening of new classes in each of the three fields. More important still, the Civil Service Commission, at the behest of the Chicago Ordnance District, had taken the ordnance inspection course firmly under its wing. Under the gentle tutelage of the august commission, this course was reorganized as the Junior Inspector Trainee program with its students not only exempt from tuition but actually paid at the rate of $1440 per year while studying.

So great an incentive was the "earn as you learn" program, that the district had no trouble in meeting its needs for personnel. When the district filled its quota and the government issued an order curtailing ordnance production, fulltime ordnance inspection courses were closed.

Now that the current shortages of women technicians have been met through Illinois Tech's war training courses, the work in engineering fundamentals and in industrial engineering has been curtailed—until the need arises again.

The program has graduated 1083 women, more than ninety-six per cent of whom are at work in war plants. The remaining four per cent includes forty-two women who have returned to their homes in cities other than Chicago and failed to report their employment status and those who have gone back to their old jobs or their kitchens, most of the latter planning to wait until their husbands are called to armed service before going to work.

Favorite subject has been ordnance inspection, with 556 women trained in this field. 361 have studied drafting; 112 have completed industrial chemistry; 28 have graduated in fundamentals of engineering; 19 have studied metallurgical techniques; and 7 have completed industrial engineering.

Graduates of the "pilot" courses entered fields in which there were more than two jobs apiece for each. Although this wealth of opportunity no longer prevails, graduates of all courses have been virtually assured of jobs, and good ones.

The top salary for an industrial "soldierette" is $2600 a year, paid to an engineering drafting graduate. The highest paid industrial engineer receives $2500. Highest salary for a chemist is $2400. The top metallurgical technician and the top woman engineer each receives $2080. Many ordnance inspectors are drawing the maximum salary in their field—$1620 annually.

All war trainees have the prospect of comfortable salaries. The industrial engineers average $2100; the metallurgical technicians, $1920; the engineers, $1800; the chemists, $1586; the draftsmen, $1438; and the inspectors, $1371.

Most women have taken jobs in Chicago or their home towns. A few, however, bitten by wanderlust, have gone to distant cities—three of them to Washington. Three girls are working in Panama.

What kinds of women have made up this feminine technical army? Bored society women? Career girls in search of glamor? Housewives eager to get away from the routine of domesticity? Among the hundreds of women who have enrolled, there have been, perhaps, a few such. But the vast majority have been simply normal women, infused with the purpose which dominates American life—to contribute every ounce of energy, every drop of blood, necessary to winning the war.

Better educated than most groups of women, sixty-five per cent have had one year of college, twelve per cent hold degrees and five per cent have done graduate work. Some of them are Phi Beta Kappas. Many of the women, however, have continued an education—this time for the grim business of war—forgotten since graduation from high school.

The stories of these women have been the stories of families making heroic sacrifices that homemakers could join the industrial army. A commercial artist put her two-year-old son in a nursery in order to study industrial drafting. Although the child had both measles and chicken pox during her period of study, she merely said, "Sacrifice? Why it's nothing compared to what the boys of Bataan went through." Another mother trained her two sons to do the house work in order to free her for war training. The younger, aged eleven, prepared dinner every evening. The elder, seventeen, did the family washing every Saturday.

There have been stories also of careers gladly relinquished in favor of the war effort. An artist of international reputation, whose paintings have been exhibited in the leading galleries of the United States and Europe, substituted a drafting pencil for her brush and palette for the duration. A noted acrobatic dancer traded the stage for the grim halls of a munitions factory. A journalist who had gone around the world on a tiny freighter and taken a 14,000-mile motor trip through Europe and Africa, swore to do all her wandering through rows of guns, tanks and bullets until the war is won. A radio singer is today peering into shell cases with as much enthusiasm as she ever gazed into a microphone. The wife of an army captain who has won state medals for her marksmanship is now spending all her time examining bullets for other people to shoot—men in American uniform in Australia, Europe and New Guinea.

Of these career girls, twenty-five per cent came from office work, trading their typewriters and shorthand books for pressure gauges, test tubes, and drafting pencils. Fifteen per cent were saleswomen, twelve per cent teachers, and five per cent already draftsmen. Others were designers, commercial artists, laboratory technicians, social workers, department store buyers, radio singers, puppet show managers, pharmacists, activities directors, librarians, newspaper women, shop owners, beauticians and architects.

Illinois Tech's fledgling technicians have gone to school eight hours a day, five days a week, a total of forty hours per week—a foretaste of the gruelling routine in factories. They have also done homework—a precursor of overtime.

Women in drafting spend most of their time learning to draw blueprints. But they also study production processes—the functions of different machines and what it is humanly possible for workers to do. And they are taught engineering materials so that they can recognize different metals and alloys.

Women in industrial chemistry take a general survey of the principles of chemistry before going into quantitative analysis and organic chemistry. Students of metallurgical techniques devote themselves to metallurgy, metallography, and drawings and specifications.

All the women study mathematics, and even women with meager backgrounds in 'rithmatic have little trouble with the work.

In addition to its full-time courses, Illinois Tech offers women war training in seventy-five evening classes, also tuition-free. Today, those enrolling have shown a preference for plastics, synthetic rubber, metallurgy, industrial chemical analysis, time and motion study, inspection methods and introduction to radio.

Illinois Tech has done everything within its powers to train women for the most strategic spots in industry. Its courses will go on so long as there is a need for them. Thus far, American women have not disappointed those who have sought them for the tasks so crucial to the fate of democracy.

A California woman heard about the program shortly after the "pilot" courses had begun. She quit her peace-time job, bought a one-way ticket to Chicago, and on arriving at the station, called the office and asked for an immediate appointment.

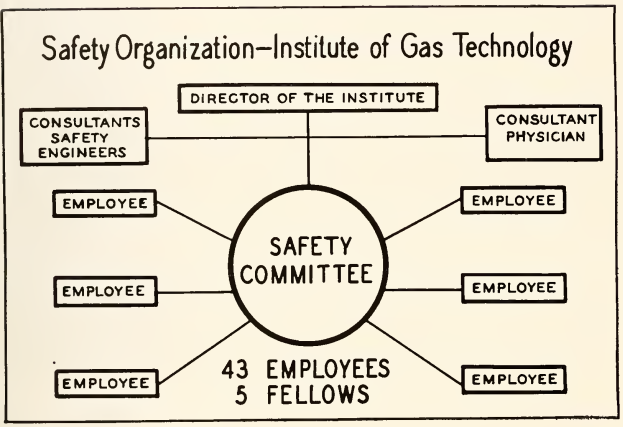
Her qualifications approved, she was accepted for the program even before she had been in Chicago a day. Now having completed her training at the government's expense, she is in war industry helping to make the weapons that will win victory.

Illinois Tech will welcome more such women—America needs them.

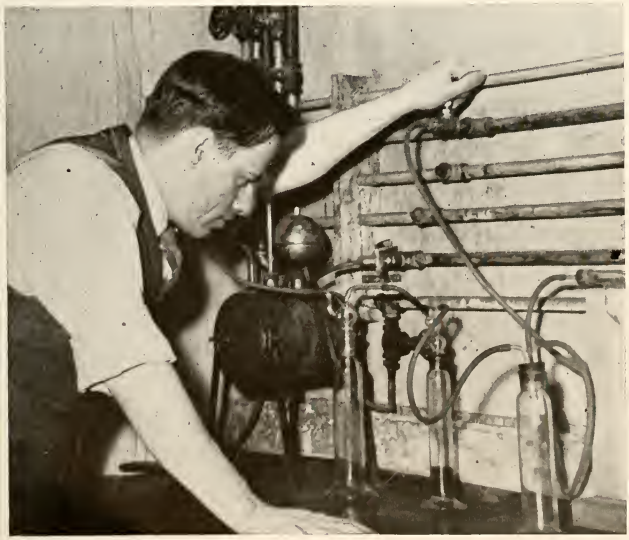
# THE SMALL PLANT CAN BE SAFE*

By

E. C. WOODWARD




Figures 1 and 2



At every safety conference there are a few men who rise to remark, "What about safety in the small plant? When we come to these meetings, we hear of wonderful improvements which have been accomplished, but usually they have happened in large plants where there is at least one full-time safety man. What can be done in an organization too small to afford the paid services of a safety engineer?".

Once upon a time, there may have been some validity to the contention that small organizations could not obtain the expert guidance needed to set up and maintain a safety program. Today, the problem can be solved without difficulty by any organization which has an earnest desire to prevent work accidents.

Let us start at the very beginning. Safety authorities have known and stated that the small manufacturing plants of our nation comprise our greatest safety problem. Most of the available statistics in the safety field are compiled by the National Safety Council. Their studies are based upon reports submitted by their member companies, and the small plants have seldom invested in Council membership. However, let us see what we do have in the nature of authoritative statistics on the small plant situation.

We have to go back to the official 1940 census reports to find the type of information we want. In 1940 the vast majority of manufacturing plants in the United States were what we would classify as small. There is no reason to suppose that there has been enough change in the proportions shown here to disturb our calculations today. While there are undoubtedly a greater number of large plants today, there are also many, many new small plants. We are safe in our statement that the great majority of our manufacturing plants are comparatively small. In spite of the huge corporations, with their thousands of em-

*This is a digest of the address presented by Mr. Woodward and Professor J. I. Yellott at the Small Plant Session of the Midwest Safety Council, May 2, 1944.

ployees, the smaller plants, with less than 500 workers each, had a total of about twice as many wage earners as the larger ones. To be exact, about 98% of the plants are small and they employ about 65% of all the workers.

When we attempt to find reliable statistics on the accident experience in the small plants, we really run into difficulties. Most of the small plants have not been in the habit of figuring their frequency rates.* Consequently, we have had only estimates to guide us. However, the war has already made some changes and more small plants have been keeping such tabulations than ever before. We have managed to survey 285 of those which do report.

The average frequency rate of the 285 small plants surveyed was just about 28. The average for 1200 plants, of all sizes, in the same area and including the 285 small ones, was 16.6 for the same year, 1943. The National Safety Council reported an average for that year, for all industries, of 14.85. It is quite likely that these particular small plants have a comparatively low frequency for their size group since they do have some safety supervision. Nevertheless, their rates are considerably higher than their big neighbors'.

So much for the background. There is no question as to the need for better accident prevention methods in small organizations. Let us see what can be done about it.

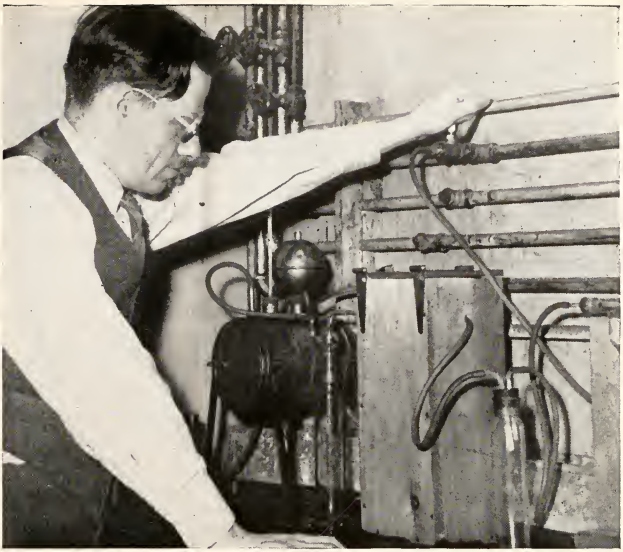
The best way to tell what can be done is, of course, to tell what has been done and how it was accomplished.

Just before the present war started, Illinois Institute of Technology came into existence through a consolidation of Armour Institute of Technology and Lewis Institute of Arts and Sciences in Chicago. Hard on the heels of the consolidation came Pearl Harbor and the huge war training program. It found Illinois Tech with a capable staff but in possession of many old buildings and much old equipment.

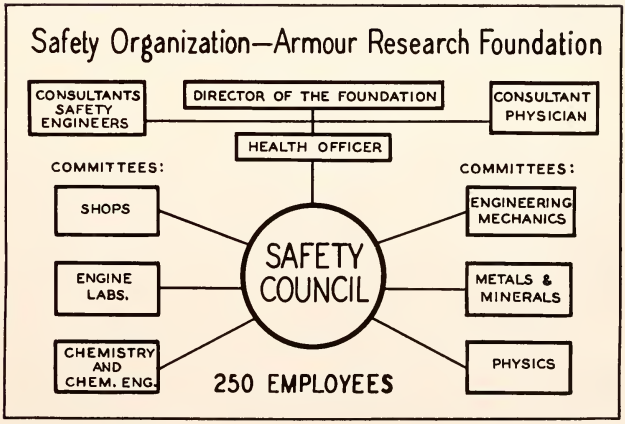
In such surroundings, there developed the largest safety training program in the country, devised by a fine group of successful safety engineers who acted as instructors. It was not long before those who were responsible for administration at Illinois Tech began to realize that they had a rather complex safety problem of their own. They set out to do something about it.

Illinois Tech has associated with it several other units which are in reality small organizations. There is the Armour Research Foundation, an exceedingly busy group of 250 people under the direction of Dr. Harold Vagtborg. Also, there is the Institute of Gas Technology, another active group of fifty employes and Fellows, who are now under the direction of Prof. John I. Yellott.

Let us see what has happened in the Gas Institute. When Prof. Yellott took over its direction a few months ago, he had been, as he still is, Chairman of the Illinois Tech War Training Committee. He had been actively and interestedly heading the Institute's safety training program and was therefore a decidedly safety-minded man. He spotted safety hazards instantly in his new surroundings.



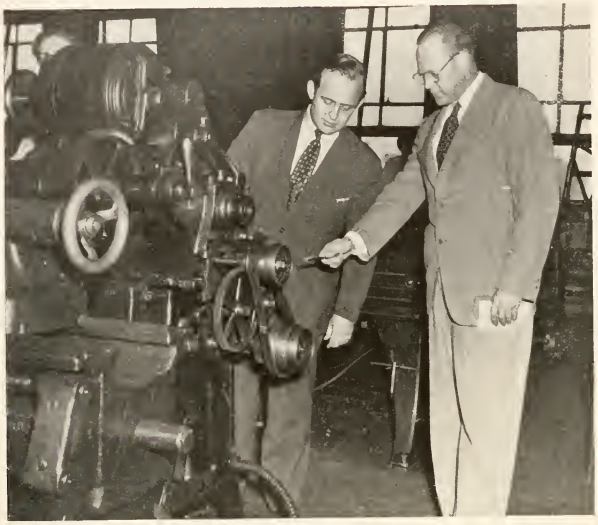
Figures 3 and 4



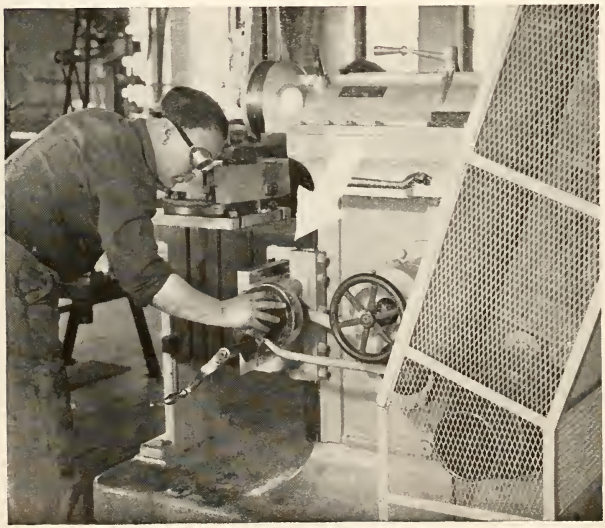

*"Accident frequency" is the number of lost time accidents per million man hours worked.

Chemists, research workers, engineers and instructors are not safety minded individuals. It is not easy to sell them on taking safety precautions. They know all the arguments that industrial workers use, plus a few more or less original ones.

However, Prof. Yellott set up the program shown in Fig. 1. The casualty insurance company's safety engineer became the new safety committee's guide and counsellor as did Illinois Tech's Director of War Safety Training.



Figures 5 and 6



The committee began to hold meetings and conduct inspections. Eventually, they had some accident investigation to make and that is when the real selling job was done.

A research worker one day was busy on a project in which he was using air from a pipe line on a wall above his bench. The air was to be passed through a container of sulphuric acid to remove any moisture from it. That type of process is a familiar and frequent one in laboratories. Fig. 2* shows how it was done.

The operators often work with sleeves rolled up and, of course, goggles have been looked upon with disdain in almost all laboratories. This operator is leaning over the sulphuric acid container while he turns on the air. He is watching for the bubbles to appear in the acid. The air valve at the time was a quick-opening type.

Instead of opening the valve slowly, the worker turned it full-on at once. The pressure was too great for the glass container. It shattered and splashed the man with sulphuric acid. Although it struck his face, Fate was kind and his eyes came through the ordeal without loss. However, he lost two weeks of time with a resulting slow-down of essential research work.

That accident put an end to any thoughts of "Accidents don't happen to experts." The eye protection program of the Safety Committee was no longer difficult to sell. Steps were taken to guard the operation where the accident occurred. Illustration 3 shows the sulphuric acid container enclosed in a wooden box. The valve has a wheel handle and is the slow opening type. Finally, the operator's sleeves are down and he wears goggles with side shields.

Not long after that, another man, a chemist, was boiling an oily organic substance over a burner. The chemist had previously lost the sight of one eye. Something went wrong in the beaker and the hot, sticky mixture splashed up toward the man's face. Because he was wearing a face shield he was not injured. The drama of the incident did a further selling job with the employes, and the shields had again proved their value. Incidentally, the chemist extinguished the small fire which resulted, by quick use of a conveniently located $CO_2$ fire extinguisher.

Meantime, progress was also being made elsewhere in the Illinois Tech family. The Armour Research Foundation, employing about 250 people, was having its problems. An eye injury to a worker who had but one perfect eye was the accident which

*Photographs by Howard Smith, Visual Education Section, E.S.M.W.T.

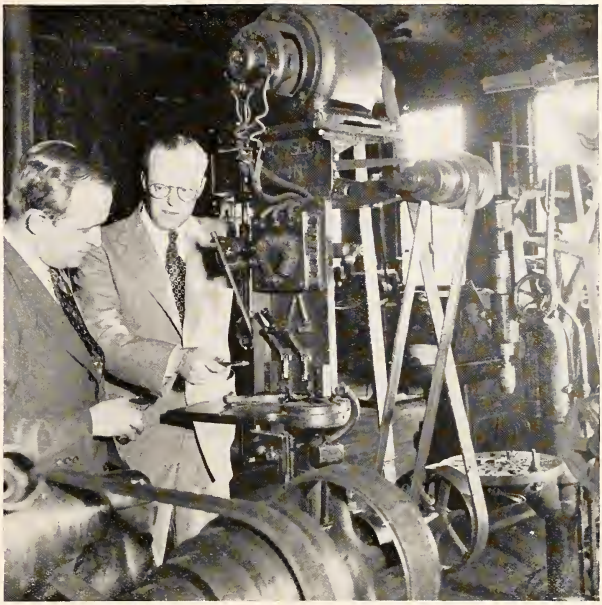
clinched the safety sales campaign in that organization. Illustration 4 diagrams the Foundation's safety organization. The Safety Council in the circle is what some other groups might call the central safety committee. It is composed of the Director, the Assistant Director, the Medical Officer, who is an employee who has had actual nursing training and experience, and the Chairmen of the small committees which operate in the various Foundation departments and buildings. Regular inspections are conducted by the committees, and they report their findings and recommendations to the Safety Council.

Of course, Illinois Tech also has a safety program which covers all the units and buildings of this widely spread organization. The Manager of Buildings and Maintenance, together with his crew of maintenance men, handles the greater part of that type of safety supervision. Both he and a goodly number of his men have taken our regular E.S.M.W.T. evening safety training courses. However, there were a few spots where special attention was needed.

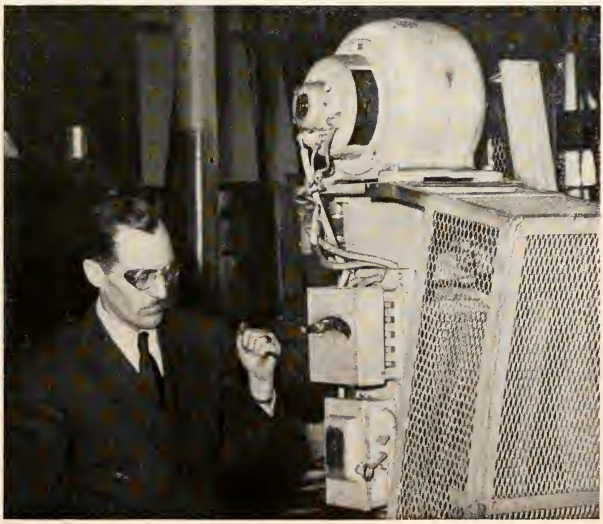
In certain of our machine shops the equipment was decidedly out-moded. Not that it was much different than what you will find in a great many small plants in industry. However, we were training men to go into industry, and it was only logical to build their awareness of safety by providing all possible mechanical safeguards on our training equipment. Therefore, two special machinists, Messrs. Gilbert and Sinclair, were assigned to do nothing but build and install machine guards under the direction of Clark Woodward, Director of War Safety Training.

One of the common hazards, not essentially of an industrial nature but one which is frequently encountered, was the stairways. They were covered with linoleum and equipped with steel nosing. The linoleum had been worn bare in many spots, leaving slippery areas of the metal beneath open, and most of the nosing strips were decided tripping hazards. Early in the program that condition was corrected. All flights were covered with an attractive red cement composition with carborundum sprinkled over the surface before it dried

Fig. 5 demonstrates a typical power transmission hazard on a belt-driven planer. Perhaps the only reason that no one has become tangled in this menace is that students work at a slower pace than they would when on production and the machinery is new enough to them to command respect. However, these hazards were eliminated as shown in the



Figures 7 and 8



following picture. Notice, please, that so-called three-dimensional seeing has been adopted. The contrast is almost unbelievable since the painting program has been completed.

In order to provide access for adjustments, the belt guard opens by sliding upward, thus making it unnecessary ever to remove the entire enclosure.

Considerable ingenuity was demonstrated by the mechanics. They had their troubles in obtaining materials and they had to play scavenger at times, but the results are far from shoddy. In Fig. 7 is a typical electrical hazard on a drill press. Notice that the control handle might easily touch the open blade knife switch or the rheostat. Fig. 8 shows how the problem was handled.

All belt guards are permanently installed. Access is, however, always provided. One of the guards lifts up and will drop back into place by gravity. The other opens like a door and has a familiar screen door spring to pull it shut. The catch on the door was homemade from a piece of alarm clock main spring.

These illustrations are not offered as shining examples of perfection. They could unquestionably be improved. However, they do indicate some of the things which can be done these days in small organizations. Formerly, the small manufacturer was not only unaware of the accident problem, he also was at a loss as to where he could obtain the kind of personalized guidance he needed. Today he can have it for the asking.

First, he can obtain free consultation from expert safety engineers through the U. S. Department of Labor. Their special agents, of the National Committee for The Conservation of Manpower in War Industry, are assisting hundreds of small plants in the setting up and carrying out of effective safety programs.

Next, the small manufacturing plant can obtain tuition free training for its own employees through the Safety Training courses offered in the Engineering Science and Management War Training program, presented under the authority of the U. S. Office of Education through engineering colleges in every part of the nation.

Finally, the local safety councils are actively interested in the small plant problem and, also, the small plant with a war contract can obtain much benefit from consultation with the plant safety inspectors of the local Army Service Commands or the comparable activities of the Navy.

Only one thing is required which cannot be obtained from outside the small organization. That is the sincere and determined desire to put an end to accidents and the losses they bring.

# TWO RECENT CONFERENCES IN CHICAGO

## THE MIDWEST POWER CONFERENCE

The meeting of the Conference on April 13-14 at the Palmer House, the seventh annual one under the present sponsorship, was a gratifying success. The record attendance of 2,500 at the 1943 meeting, which was over six times that at the first gathering in 1939, was considerably surpassed. Despite the current transportation difficulties, every section of the country east of the Rockies was well represented by outstanding engineers and administrators. The opening meeting and the session on Central Station Practice were each attended by more than a thousand people. There were five hundred and fifty at the dinner, and about two hundred and seventy-five at each of the two luncheons.

Professor Stanton E. Winston, Associate Director of the Mechanical Engineering Department, who is the Director of the Conference, attributes its great and increasing success to the cooperation of the eight colleges and universities associated with the Institute in its sponsorship and to the encouragement given by private industry, municipal power plants, and Federal agencies. The representatives to the Conference of Iowa State College, the State University of Iowa, Michigan State College, Northwestern University, the University of Michigan, the University of Illinois, Purdue University, and the University of Minnesota have rendered indispensable services. Public utilities, companies manufacturing power equipment, fuel industries, industrial power plants, municipal power plants, the Federal Power Commission, the Tennessee Valley Authority, and many other organizations in the power field have encouraged their men to attend the meetings and to participate in the programs. They subscribe generously to the Proceedings, now with a circulation figure of 1,400.

It may be added that Professor Winston, as Secretary of the Conference from 1938 and as Director since 1940, deserves great credit himself. His work on the Programs, which circulate to the number of 35,000 and are reproduced in the *Engineer* and other publications, and his editing of the Proceedings have done much to make the enterprise widely and favorably known. The comment of Mr. J. A. Krug, Program Vice Chairman and Director of the Office of War Utilities, is typical of the many which have been made to Professor Winston verbally and by letter: "I consider the Midwest Power Conference one of the most important forums in the country."

The purpose of the 1944 meeting, as of its predecessors, was to effect a sharing of ideas about present and future activities in the field. This year considerable attention was given to the postwar conversion and utilization of the various sources of power which have been so enormously expanded in the war years as well as to their present operation. The theme of the meeting was "Power Promotes Victory; Planning Promotes Prosperity." At the dinner, Mr. J. A. Krug, spoke on "War Time Power Supply," and at the opening meeting Mr. Alex D.

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# RECIPIENTS OF HONORARY DEGREES FROM ILLINOIS INSTITUTE



Top row: Barnes, Bolte, Burgess, Cunningham, Dow, Elliott

Bottom row: Harrington, Lewis, Mortensen, Rafferty, Sims, Wagner

The fiftieth anniversary commencement of Illinois Institute of Technology on February 21, was made especially memorable by the presence of the twelve distinguished men upon whom honorary degrees were bestowed. There were four presidents of large companies, three engineers who held key positions in industry, two major-generals, the director of Aeronautical Research of the National Advisory Committee for Aeronautics, the Commissioner of Subways and Superhighways of the City of Chicago, and the President of Purdue University. In recognition of their contributions to the national life, the degree of Doctor of Science was conferred upon the President of Purdue and that of Doctor of Engineering upon each of the eleven other men. It will be a particular satisfaction to all who have ties with the Institute to observe that four of this select group —a company president, a company engineer, a general, and the Commissioner of Subways and Superhighways—are members of our alumni body.

A brief account of the career of each will be found below, preceded by the citation of his achievements which was made at Commencement. Our always present limitations of space make it impossible to give more than a few highlights of the lives of the twelve.

GLADEON MARCUS BARNES, Major General, United States Army, Chief of the Technical Division, Office of the Chief of Ordnance, was cited "For technical contributions in research, design, and development of weapons of modern warfare; and for distinguished service as an officer of the United States Army. . . ."

General Barnes, a native of Vermontsville, Michigan, has enjoyed a long and fruitful career in our army. He was appointed a Second Lieutenant in the Coast Artillery Corps soon after receiving the degree of Bachelor of Civil Engineering from the University of Michigan in 1910. He saw service in France as special assistant to General John H. Rice, Office of the Chief Ordnance Officer of the American Expeditionary Force Between the World Wars, he was given a variety of important assignments.

In 1939 he was made Chief of the Technical Staff, Office of the Chief of Ordnance for a year, and in 1940, Assistant Chief of Industrial Service of that Office in charge of research

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# BETTER MOUSE TRAPS

## New Field Units for Strain Measurements

By

C. O. DOHRENWEND

The rapid growth of electronic and X-ray strain measuring techniques in the laboratory has made possible the development of new field methods for experimental stress analysis. With the advance in electrical strain measuring equipment, it has become possible to operate by remote control a large number of strain gages from one point far removed from the actual gaging points. But even though the gage units are small, the control and recording equipment for dynamic work has remained somewhat cumbersome and bulky. This means that in all field work many difficulties arise in the transportation and operation of these control and recording devices. It is therefore very desirable that mobile laboratory units equipped with this heavy equipment for controlling multi-electronic channels for strain measurement be available. When such a complete strain measuring laboratory can be moved into the field intact, most of these difficulties are eliminated. In like manner the use of X-ray diffraction for the determination of residual strains placed in large structures by welding and other fabricating methods requires very bulky equipment and the use of laboratory and dark room facilities. In order that this new method now at the disposal of the engineer for some of the most complicated mechanical strength determinations may be made usable for field work, it is again necessary to have a mobile field laboratory.

Mobile laboratory units have been used by the Armour Research Foundation in many of its stress analysis investigations. Their success has led to the construction of two new units. The first is the laboratory trailer unit, and the second provides services for the mobile laboratory trailer.

The laboratory unit when completed will contain proper facilities for the carrying out of both electronic and X-ray measurements. Its use allows the measurement of static strains for a large number of gage points, and also provides eleven dynamic strain channels. One channel is designed primarily for the recording of high frequency strain variations up to 6000 cycles per second. Ten of the dynamic strain gage channels can be used in measurements of strains which vary with a frequency up to 100 cycles per second. Nine of these are permanently installed, and one is removable from the trailer unit. The nine permanent channels are complete with cathode ray oscilloscope and 16 mm photographic recording equipment. The gages operated in these channels may be as far as 300 feet from the control equipment. In order to correlate the work of the men at the gage point with the work of the people in the mobile laboratory, a communication system of the interoffice speaker type is used. The complete electronic gaging system may be fed by power from the outside connected to the laboratory through a voltage control transformer or by power generated at the auxiliary unit with a gasoline generator set. The portable X-ray equipment carries its own cooling system consisting of a small water recirculation system powered by an electrically driven pump. This mobile laboratory also contains a small heating plant, a dark room, an operator's control desk, and a light work bench. The cables from the gage to the mobile laboratory are connected to the laboratory through a contact box in the side of the unit. When fully equipped and ready for operation, the mobile laboratory may be towed by a light passenger automobile.

The second unit, which is the service trailer, carries 2500 feet of shielded cable on special cable racks for use with the electrical gages. It contains transportation facilities for a portable X-ray diffraction unit with its accessories and the motor generator set for supplying power in the field. In this unit mechanical strain gages and stress coat equipment are also stored. Besides service equipment for the laboratory trailer, this unit carries a full supply of hand tools, car tools, car jacks, and all other auxiliary necessities. When fully loaded, it too is capable of being towed by a light passenger car.

These two trailers are so designed that they can be rolled into the Foundation's main Mechanics Research laboratory and operated for strain measuring purposes there as well as in the field. With their use, it is a very simple operation to move to the field for measurements on bridges, ships and other large structures without the usual prolonged preparation at the main laboratory as well as at the place of measurement. Complete and self-contained, the mobile units make possible the rapid measurement of strain for the solution of a wide variety of problems which otherwise could be handled only with considerable inconvenience and delay.

The Mobile Stress Laboratory






Research will be the principal activity of the Gas Institute for the duration, since Selective Service regulations have eliminated the graduate study program here as in other institutions. Of the twenty-one Fellows who constituted the student body last September, nine are now ensigns in the U. S. N. R.; seven are technical aides in the Field Service of the O. S. R. D., with assignments ranging from Massachusetts to California; two are associated with war research of the utmost secrecy in an eastern university; one is in the research laboratory of a large oil company; one is completing his thesis and awaiting a decision from Selective Service; while one is a member of the Institute's research staff.

It is contemplated that the educational program will be re-established when peace returns, and the Institute hopes that all of the past Fellows will return to complete their work. Significant research has already been accomplished by the five Fellows who recently completed their second year. Publication of their results will add valuable information to our knowledge in the fields of catalytic pyrolysis of hydrocarbons, viscometry, supersonics, heat transfer, and the formation of gas hydrates.

Plans for re-establishing the educational program include a continuation of the cooperative features which proved to be such a valuable phase of the original program. It is expected that a four year Ph.D. program will again be in action, with the first three years devoted to course work and the master's thesis, and the last year to research for the doctorate. Work assignments will be rotated so that no more than three of the four classes will be on the campus at any time, and at least one group will always be at work in the industry. Courses will be staggered in such a way that prominent representatives of the industry may be borrowed for periods of several months to give one or more courses in their special fields.

Improved laboratories will be set up when war-surplus equipment becomes available, and staff members are already giving thought to the quarters which will be made ready in the Gas Institute's new building in the post-war Technology Center.

Research for the industry is now the principal activity of the Institute. During the current year, twelve new projects have been established for member companies, and the total volume of this research work will approach $160,000 for the year. Consistent with the Institute's policy on sponsored research, details of these

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# HELP! HELP! HELP!

By

JOHN J. SCHOMMER

Our placement department has been swamped by calls for engineers. They come from all over the country—by telephone, telegram and by personal appearance.

The requests are for 4-F's, men over twenty-six years old, and for women. As for the latter, there were only forty-three female engineers as possible graduates last year.

The types of industries seeking engineering personnel are most diverse. Chemists, physicists, chemical, mechanical and electrical engineers are sought. Last month, April, was characterized by greatly increased calls for faculty members and for older men for sales engineering and sales management.

The sudden surge upwards of demands for engineering and scientific aid is no doubt due to the demands of war for younger men. Selective Service System is reaching far and wide for youths eighteen through twenty-five years of age with every indication that the upper age limit will be increased.

To fill the urgent need for youths as infantrymen, the A.S.T.P. in colleges has been abandoned; thirty-six thousand air corps men have been transferred to the infantry. If you are an officer in the air corps and you "stumble" in any of the regulations, you may find your way quickly to carrying a rifle. Single men and married men without children in colleges, industries and research laboratories through twenty-five years of age must file 42A Specials with the state directors of the respective states the colleges, research laboratories or industries are located in, and most of the 42A's asking for deferments are rejected.

Brilliant students studying for advanced degrees in science and engineering unless loaded with teaching are out. Pursuit of studies leading to B. S. degrees in science or engineering is out unless the student can take his degree by July 1st, 1944, or is classified 4-F.

Remaining in some colleges are a few students in specialized studies, the Navy V-12 midshipmen, 4-F's, and males under eighteen years of age. It appears many colleges will close or have a most desperate struggle for survival. Since Uncle Sam has been so generous to so many of his poor nephews and nieces scattered all over the world, maybe he might print a few more billions to hand to non-tax-supported American colleges. He surely has been most liberal to tax-supported State colleges.

If specialized and advanced learning is so severely curtailed and many engineering departments in research laboratories and industry are being wrecked, who are to blame? Don't blame your draft boards for the recent draft regulations. The Selective Service System regulations emanate from Washington. The local draft boards with much abuse, without pay and the loss of much valuable time must carry out orders from Gen. Louis B. Hershey, like good soldiers. The general receives his orders from somebody else. The draft boards have been overwhelmed with a flood of changing regulations in a steady stream for three years. These regulations must be read, studied, and digested by the local boards. The marvel to me is how the board members do it and yet find the time to earn a living.

It has been seen in print purported to emanate from important people in other countries that the United States is the "arsenal of democracy." These people said "Give us the tools and we will finish the job." I guess maybe the job was too tough. But what will 50,000 engineers from twenty through thirty-seven years of age do to aid, even if they are all taken? Can they be spared from industry, research, and teaching? The absence of these engineers may wreck production, and it may be doubted that, when they are spread to the four quarters of the globe, they can serve better as soldiers than as engineers.

According to Selective Service System there are:

| | |
|---|---|
| 3,357,000 | disqualified men after physical examination, |
| 4,645,000 | deferred for dependency reasons, |
| 3,834,000 | deferred for occupational reasons, |
| 11,836,000 | men deferred for one reason or another. |

As yet there is no conscription of women. Maybe that is to come. As yet there are millions in other countries that could be armed. Maybe that is yet to come. There are over three million 4-F's. Maybe a law will be passed to subject hundreds of thousands of these to slight operations to make them available. Maybe that is to come.

If we need increased production, if the loss of engineers will seriously affect this, the government may allocate engineers back to industry. But if this is a long war as many think it will be—three to five years to go—the drying up of a steady stream of engineers and scientists by the recent acts drastically curtailing the supply of college trained men will be the cause of great regret.

# THE BOOK SHELF

THE EDUCATION OF T. C. MITS. Drawings by Hugh Gray Lieber; words by Lillian R. Lieber. W. W. Norton & Co., ©1942, ©1944. $2.50.

[A review reprinted by permission from the *Chicago Sun Book Week*, March 7, 1944]

You pick up *The Education of T. C. Mits* and the first thing you will say to yourself is, "What a funny little book!" To start with, it looks as if it were written in free verse, although it isn't. As the authors explain:

Writing each phrase on a separate line
Facilitates rapid reading
And everyone
Is in a hurry
Nowadays!



Then you look at the pictures in the book—weird, comical, gay pen-and-ink drawings of—of what? It's difficult to say—strange little creatures, sometimes resembling human beings and sometimes not, sometimes riding around in chariots made out of mathematical symbols, sometimes flying through fantastic landscapes. After looking at a few pictures and reading half a page of text, you will not put the book down until you have read it. Indeed, in the several days since I got the book, four of my friends have tried to run off with it, and only gave it up after a heated struggle.

Who is T. C. Mits? The authors explain. He is "The Celebrated Man-In-The-Street"—in other words, you and I. Like the cats in Dr. Masserman's experimental cages at the University of Chicago, T. C. is confused by the strange, complicated world in which he finds himself. He is slowly going nuts trying to make sense out of the conflicting advice he is given. Science will save the world, say some; science is wrecking it, say others. Use your common sense, say some; common sense is not enough, say others. Human nature must be remade, say some; human nature can't be changed, say others. Where is T. C. to turn, and how is he going to get out of his mess?

There is a way out for T. C., say the Liebers, and it is to be found by "streamlining the mind with mathematics." At the word "mathematics," of course, a large number of my readers with a liberal-curriculum background will promptly go into a nose-dive and wail, "I can't understand mathematics!" They are just the people who need to hang on until we get over the hump. The Liebers' book requires practically no previous knowledge of mathematics. They start out with a promise "not to use mathematics as an instrument of torture," and they keep their promise. Then they go right to work streamlining the reader's mind by explaining things about theoretical modern mathematics—such things as I never imagined could be explained to one who, like myself, had to hire a special tutor in order to get through freshman algebra. And as you read their amusing explanations (for example, of the new geometry of finite spaces) you can just feel the barnacles being scraped off your mental hull. If you don't come up after reading this book with an exciting sense of the possibilities of human thought (including your own), then your intellectual arteriosclerosis is so far advanced that you might as well go back to your *Reader's Digest*.

A number of solemn and polysyllabic studies have been written on the philosophy of science and, while I would not discourage anyone's reading any of them, I feel that more has been said by the Liebers in two short chapters entitled "Our Totem Pole" and "The Totem Pole (cont.)" than in most big books on the subject. Is science a bad thing because it makes bombing planes and poison gases possible? Or is it neutral because it can produce both bombing planes to do the damage and sulfanilamide to repair it? Or does a study of the whole structure of science, and the relation of its various branches to each other, reveal an implicit morality in science? Is scientific "neutrality" another piece of old-fashioned nonsense we must get out of our systems? It is the conviction of the Liebers that science is profoundly moral, and that the thoroughgoing scientist cannot any longer say, "It's none of my business what politicians and businessmen do with my discoveries." The structure of science shows co-operation and democracy at its very heart, however imperfectly they have been realized to date. These chapters are required reading for every scientist and technical man, as well as for T. C.

Hugh G. and Lillian R. Lieber are already well-known in mathematical circles for their earlier books, "Non-Euclidean Geometry," "Galois and the Theory of Groups" and "The Einstein Theory of Relativity" which restate in language that everyone can understand what modern mathematicians are driving at. Their new book is so good that it is time their reputation got out beyond mathematicians to the public at large. Out of the insight we derive from their explanations, we get a new way of approaching and grasping, without fear, the strange and the disturbing. As poor, bungling dopes trying to cope with world-wide social, economic and political catastrophes with little more equipment than a score of wornout formulas inherited from our grandpappies, we need, along with the willingness to chart the uncharted, the kind of fundamental revision of habits of thought that modern mathematical theorists can instruct us in. The Liebers, without even requiring that their readers know mathematics, give us courage for the adventure and show us how we can get started on the revision. If that isn't getting a lot for little, I don't know what is.

S. I. HAYAKAWA.

# FROM YEAR TO YEAR

## A RECORD OF OUR ALUMNI AROUND THE WORLD

### MEN OF THE MONTH

FENSHOLT



PEEBLES



The alumnus of distinction for this month is Adolph H. Fensholt. His father and mother, both of Danish ancestry, like many other robust sons and daughters of Scandinavian countries, responded to the challenge of the New World. They settled in Chicago which became the birthplace of their first son Adolph in 1889.

According to some historians, 1889 is the year the American Frontier ceased to exist. Hence, by choosing that year for his entry into this hectic world Fensholt missed the favorite occupations of the early pioneers, such as plowing prairies, panning for gold, or trying to persuade the Indians by force that they were not taking full advantage of their agricultural and lumbering opportunities. Being denied these exciting adventures, he had to be contented with collecting Kickapoo Indian cutouts from packages of Arbuckle's Coffee, and, as a substitute for the war whoop, he took fiendish delight in tormenting his grandmother by practicing diligently on a ten dollar Stradivarius. Although his fiddle repertoire is of the 1895-1905 vintage, he still scrapes a tuneful bow. Critics say that his rendition of "In the Shade of the Old Apple Tree" brings down the house—well, an apple, anyway.

One day while under the spell of this musical classic he read of Sir Isaac Newton's experience with an apple under a similar shady tree, and from that moment Fensholt's life followed a new course. He abandoned his promising career in music, read Jules Verne avidly, and plunged into the mysteries of the world of physics. Before he had acquired a grade school diploma, he organized a neighborhood science club whose chief diversion was the electrification of innocent-looking door knobs and kitchen stools.

After eight long years in the grades, Adolph Fensholt, at the age of fourteen, embarked upon a business career by mastering the hieroglyphs of the Pitman system of shorthand. Thus fortified he landed a job as stenographer, record keeper, shipping clerk, and errand boy at five dollars per week. But these manifold duties failed to occupy the embryo businessman's full time, so he kept a copy of Ganot's Physics in the stockroom for an occasional flight into the cosmos. One day his Scrooge-like employer

intruded into the inner sanctum of the stockroom, and the cosmic flight ended. So did the income of five dollars per week.

Not to be daunted by such a crash landing, Fensholt decided to explore even farther into the Newtonian universe, and in 1904 registered as a student in Lewis Academy, the high school division of Lewis Institute.

It is fitting to note here that the decision to attend Lewis Institute was prompted by an earlier meeting with Prof. Fred A. Rogers who, in 1902, lectured throughout the city on the then amazing Marconi wireless telegraph.

Under the spell of a galaxy of young lecturers, such as Professors Woodworth, Rogers, Nies, Smith, Trowbridge, Peet, Cobb, and DePue, Adolph Fensholt could not fail to advance and ultimately . . . or in 1913 . . . received his degree of Mechanical Engineer. Meantime, he had been part-time instructor as assistant to the inimitable Phil Woodworth in day and evening classes.

Thus ended the academic period. Ahead lay the great plateau of life. Not knowing that a great war was destined to upset the world in 1914, our hero had acquired a heroine in 1910 . . . long before college days were over. An accomplished pianist, intimately associated with Jane Addams and Eleanor Smith of Hull House, the youthful Ethel Heath decided that, since music hath charms, she probably could endure the companionship of an engineer and physicist. But Einstein seems to have prevailed over Bach and Beethoven, for their daughter, Dorothy, is now teaching science correlation at Northwestern University.

Fensholt's first plunge into the cruel world was made as technical assistant to the Board of Supervising Engineers. His first assignment in 1913 was the designing of floor beams for the Chicago subway. A generation later, another group of engineers finished the job by junking the 1913 high-level subway plans for the finally adopted low-level tubes.

But digging subways entirely on paper offered no excitement to our budding engineer; so he spent the next six years as field service engineer for a manufacturer of electric motors, traveling far and wide in pursuit of "trouble." When Major Woodworth, then in the Education and Recreation division of the General Staff of the War Department, needed an instructional manual for army electricians, Adolph Fensholt was asked to prepare it. With offices in Washington and a pocketful of government travel vouchers, our textbook writer in midwinter turned up appropriately in Florida to do his assignment. But an unfeeling staff suddenly decided that Camp Grant was a more inspiring location for creative talent. Fensholt arrived in Rockford in time for a review by General Pershing on a day when the thermometer registered nine below zero at mid-morning, a practical but painful experiment in calorimetry.

With the manual completed, Fensholt returned to industry, but no longer as an engineer. It is sad to relate that he fell upon evil ways, for, in forsaking the rectilinear path blazed by the patron saints of engineering, Adolph Fensholt threw discretion and reputation to the winds and slipped into the devious ways of advertising. From this error he has never fully recovered, although it can be said in his defense that he writes advertising about things electrical, mechanical, and perhaps chemical . . . but never about such chemico-mechanical marvels as lipstick or carbonated beverages, "parfum exotique," or patent medicine. There are codes of honor, even among advertising men.

When Adolph Fensholt is not absorbed in writing advertisements for his clients he relaxes by writing alumni fund campaign literature for Illinois Tech. He is searching diligently for a box-top or Christmas seal idea to popularize alumni fund giving. If this search fails, he hopes to revise the Victory Tax law to include a regular payroll deduction for the Illinois Tech Alumni Fund.

This involvement in alumni affairs ultimately led to his participation in founding the new Alumni Association of Illinois Institute of Technology. With Warren McCaffrey he wrote the new alumni constitution. To keep McCaffrey and Fensholt under proper surveillance, both were elected to the Board of Trustees as alumni representatives.

By way of avocation, Adolph Fensholt delves into amateur photography and occasionally gets a Kodachrome picture of good composition or true-to-life color. Rarely does he succeed in combining both elements in the same picture, which, of course, permits him to retain his amateur status. When in New York he pokes into quaint book shops looking for incunabula . . . an excellent crossword puzzle name for early printed books. And, when he despairs of the sanity of this civilized world, he goes to his cottage at Ephraim, Wisconsin, where he sets up a sizeable telescope to view the splendors of the starry heavens. The spirit of the scientist cannot be completely submerged . . . not even in an advertising man.

HOWARD A. CARTER.

## JAMES CLINTON PEEBLES

Certainly to be included among the prominent graduates of Armour Institute of Technology is the Dean of Engineering of Illinois Institute—James Clinton Peebles. His thirty-six years of unselfish service as a teacher and an administrator amply qualify him for nomination as a Man of the Month.

Jim Peebles was graduated from Armour Institute in 1904 in the department of electrical engineering. He completed his last year of high school study at Lewis Institute in 1900 and then decided that his college training should be in the field of electrical engineering. Lewis at that time did not have a complete electrical curriculum and so he entered Armour. In 1908 he was awarded the professional degree of Electrical Engineer by Armour, and, in the same year, the degree of Master of Mechanical Engineering by Cornell University.

Dean Peebles was born in Scotland and spent his boyhood in the small town of Shenandoah, Iowa. He received his primary education there and all but the last year of his high school training. When his family moved to Chicago, Dean Peebles entered Lewis to complete the high school phase of his education.

After graduation from Armour, Dean Peebles was employed by The Western Electric Company in the telephone inspection department. He then became a sub-station operator for the Commonwealth Edison Company, at which time he decided to attend Cornell University for advanced study in mechanical engineering. During his two years' residence at Cornell he served as graduate assistant.

Upon visiting Chicago at the conclusion of his study at Cornell, he had occasion to speak to the Institute's great teacher of mechanical engineering, George Gebhardt, who offered him a position as instructor on the mechanical engineering staff. Dean Peebles relates that he had a verbal agreement to return to Cornell as an instructor, but the possibilities of again returning to Chicago and his Alma Mater outweighed the inducements offered by Cornell. His work at the Institute was largely devoted to the experimental laboratory, and many instructional experiments were developed by him. He was made assistant professor in 1912 and associate professor in 1917. In 1929 he became professor of experimental engineering and served in this capacity until 1941, when he became Acting Dean of the College of Engineering. During the period 1940-41 he was acting director of the mechanical

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engineering department, and in 1942 he became Dean of Engineering of Illinois Institute.

During his entire teaching career he has acted as consulting engineer on electrical and mechanical problems for many industries. His especial interest was in the field of heat conductivity and especially in insulating materials. More than thirty years ago, with the aid of one of his students, Dean Peebles devised an instrument for measuring the flow of heat through various types of insulating materials. This was known as the "guarded hot plate method" and remains today as a standard, having been adopted by the American Society for Testing Materials. Technical papers covering this phase of Dean Peebles' study of the method of testing heat flow appeared in early issues of the *Engineer*. He devised some of the initial tests on insulating materials that now have wide commercial usage. A comprehensive article covering temperature measurements in power plants was published by him in the magazine *Power* and was very favorably received.

He has been on the staff of the Armour Research Foundation since the time of its creation and has devoted his attention principally to the field of insulation. He is now acting in a consulting capacity for the Foundation, since most of his time is taken up with his administrative duties. In the early twenties, with the rapid growth of the refrigerator car industry, he devoted much time to solving problems that had arisen in the design of this equipment.

While an undergraduate student at the Institute, Dean Peebles held down the "hot corner" on the baseball teams of '02, '03 and '04. Aside from this he was a member of his class bowling team, but the records do not indicate whether or not he bowled any 300 games. He was greatly interested in class activities and continued this interest in later years when he served on the Board of Managers of the Alumni Association in 1912 and 1913. He has been the perennial chairman of the Association's nominating committee and has always attended the meetings of this group.

One of the most popular features of the *Engineer* in past years has been Dean Peebles' series of articles entitled "I Was Thinking." Usually these articles were reminiscent of the early days of Armour Institute. Perhaps the article that gained the widest distribution was that entitled "Us Engineers Don't Need No English." This focused attention upon the engineers' need for clear and understandable English in the presentation of their reports. The article was reprinted in numerous technical publications.

At Cornell he was a member of Gamma Alpha, graduate fraternity, and was affiliated with Sigma Kappa Delta when it was active at Armour. He is a member of Sigma Xi, Tau Beta Pi and Pi Tau Sigma. He is a member of the American Society of Testing Materials and has served for many years as a member of the committee on thermal insulation. He has been honorary chairman of the Armour Student Branch of the American Society of Mechanical Engineer and is a member of the Society for the Promotion of Engineering Education.

Dean Peebles has an intense personal interest in the welfare of the students at the Institute. This interest continues long after their graduation, and his amazing ability to remember names and recall events has caused many returning students to marvel at his memory. One of his greatest problems during the War is to advise students as to whether they should stay in school or join the armed forces. Invariably his advice has been to remain in school as long as possible and certainly to return to college when hostilities cease. As Dean, he has had to certify students under the selective service system to local draft boards when they have been eligible for deferment.

Dean Peebles is married and lives with his wife at 9846 South Hoyne Avenue, Chicago. His only son, a graduate of the Chicago Academy of Fine Arts, is a commercial artist.

A. H. Jens

## 1901

MARKS, FREDERICK R., Ac. L., a former Associate Professor of Mathematics at the Lewis Division of Illinois Institute of Technology, is now living at 423 N. Vine Avenue, Ontario California.

## 1904

DOERR, ROBERT, Ac. A., Arch. A. '08, has moved to 5487 Hyde Park Boulevard, Chicago 15, Illinois.

NORRIS, HELEN, Ac. L., has just completed thirty significant years of successful personnel work. Dean of Women for the Commonwealth Edison Company, 72 W. Adams Street, Chicago, Illinois, she was one of the first important women counselors in Chicago. She began as company librarian, a responsibility which brought her into direct touch with the secretaries of the officials of the company who wanted, on a moment's notice, a scientific book or treatise. As part of her job she dealt with widely different personalities and drew from them her own pattern of an ideal employee—an ideal which through the years she has held faithfully before the eyes of the young women who have come to sit in her office and talk quietly across a desk. Varied interests round out Miss Norris' career. She is now vice-president of the University of Chicago Alumni Association, and recently received the University of Chicago citation awarded to distinguished graduates.

Her willingness to assume responsibility in her leisure hours has crowded her life with honors.

## 1906

TOLSTED, ELMER B., M.E. L., whose childhood interest in trains has developed spectacularly during the last fifty years, recently opened to the public an exhibit of trains in the building formerly occupied by the Chicago Historical Society at 632 N. Dearborn Street, Chicago, Illinois. The exhibit is open daily between 2:00 P.M. and 5:00 P.M. and between 7:00 P.M. and 9:00 P.M. Only three of the twenty-six trains that will ultimately circle the 3,000 feet of railroad track that incloses the exhibit will be in operation, but others will be added regularly. These run continuously, and sound effects accompany their operation. Reproductions of factory buildings, industrial sites, rivers, and bridges will be placed strategically, and the result will be a model mechanical town. Tolsted said his project is one of those things that can go on for years. There is just no limit to the items that can be added.

## 1907

VAUGHAN, MRS. FREDERICK M. (CAROLINE STOLTZ), Ac. L., resides at 3131 Ernst Street, Franklin Park, Illinois.

## 1908

CONVERSE, WILLIAM I., C.E. A., C.E. A. '12, has moved to 6724 Beverly Boulevard, Los Angeles, California.

## 1909

KRILL, HENRY, M.E. A., of 129 Grace Court, Aurora, Illinois, has received a patent for a simple little nasal filter adaptable for use when the air is heavily laden with dust or other small, irritating particles. It consists of a plug made of a fibrous material which does not interfere with the passage of air through it, but acts as an effective filter for particles of dust.

## 1910

MOULTON, H. HARPER, Ac. L., is a Field Director for the American Red Cross. His residence address is 611 Turner Avenue, Glen Ellyn, Illinois.

## 1911

ALLAN, JAMES R., Ac. L., is Assistant Manager of Industrial Engineering and Construction for the International Harvester Company, 180 N. Michigan Avenue, Chicago, Illinois. His mailing address is Box 501, Fox Lake, Illinois.

## 1913

BOUTON, ARCH., Ac. L., is an Accountant for the Aluminum Company of America, Brookfield, Illinois, and resides at 3141 Wenonah Avenue, Berwyn, Illinois.

## 1914

GREENE, PEARL S., H.E. L., is Head of the Home Economics Department, University of Maine, Merrill Hall, Orono, Maine.

## 1915

CARPENTER, BERNIECE A., D.E. L., is Secretary for the New York Central System, 1020 Terminal Tower, Cleveland, Ohio. She resides at 12009 Clifton Boulevard, Cleveland.

## 1916

SLUPKOWSKI, JOSEPH A., Arch. A., is now living at 2904 N. Washtenaw Avenue, Chicago, Illinois.

## 1917

MAJOR GENERAL CHARLES L. BOLTE, United States Army, Ch.E. A., was recently awarded the Legion of Merit for exceptionally meritorious conduct in the performance of outstanding service. As Plans Officer of the Special Army Observers Group, London, England, and later as Chief of Staff of the European theater of operations from May, 1941, to June, 1942, General Bolte displayed unusual professional ability, rare discernment, and devotion to duty, and rendered service of outstanding value to the Government in the planning for, and reception of, the United States Army forces in the United Kingdom and the subsequent establishment of the European theater of operations.

## 1918

HAIZMAN, EDWARD, E.E. A., is employed by the Western Electric Company, Kearney, New Jersey, and resides at 16 Grove Street, Crandon, New Jersey.

## 1921

BALDWIN, FRANCIS M., Arch. A., has been promoted from Major to Lieutenant Colonel. Colonel Baldwin is forty-three years old, has been a reserve officer since 1933, and was called to active duty in November, 1940, as a Captain and Assistant Utilities Officer at Fort Sheridan. He became Post Engineer in December, 1941.




# . . . a wartime problem in Engineering

THIS is a quartz crystal. Its job is to hold an airplane or tank radio exactly on its assigned wave length—so fighting men can get messages through quickly, clearly.

Under pressure of war's demands for immense quantities of radio equipment, Western Electric engineers have helped to revolutionize crystal production techniques. Consider these problems:

Each of these little wafers is cut, ground and lapped to almost incredible tolerances;

Each one is metal plated in a vacuum;

Each one is mounted on wires so small that many operations and inspections must be performed under a microscope.

Amazing new machines and methods were devised to do such jobs quickly and well—and the crystals are turned out in unprecedented numbers. One of our four shops now makes as many crystals in a day as the entire industry used to make in a year! To date, Western Electric has produced more than 9,000,000 crystals for war.

Mass production of crystals is just one of many fascinating problems that have been and are being solved by engineers at Western Electric—the nation's largest producer of electronic and communications equipment for war.

*To speed Victory, buy War Bonds regularly—all you can!*



Mellinger, George H., Ch.E. A., former refrigeration sales development manager for Westinghouse Electric & Manufacturing Company, Mansfield, Ohio, has been appointed manager of the company's household refrigeration department to direct post-war plans. Mr. Mellinger resides at 568 Highland Avenue, Mansfield.

## 1922

Olsen, Marvin R., M.E. A., is Process Engineer for Aren's Controls, Inc., 2251 S. Halsted Street, Chicago, Illinois, and resides at 616 Euclid Avenue, Glen Ellyn, Illinois.

Pardue, Austin, A.S. L., recently was consecrated fourth Bishop of the Pittsburgh Episcopal Diocese. The bishop and Mrs. Pardue reside at 5565 Aylesboro Avenue, Pittsburgh, Pennsylvania.

## 1923

Lowden, Virgil E., E.E. A., is employed by the Bell Telephone Laboratories, Murray Hill, New Jersey, and resides at 425 Woodland Road, Madison, New Jersey.

## 1924

The Alumni Office recently received some very interesting clippings and letters sent to his wife by Captain Charles Pava, M.C. (A.A. L.), 95th Evacuation Hospital, APO No. 464 c/o Postmaster, New York, New York. They tell of his experiences in the United States Army Medical Corps during the campaigns of North Africa and Italy.

Anyone interested in reading them may do so at the Alumni Office, 79 W. Monroe Street, Chicago, Illinois.

## 1925

Freeman, Richard E., F.P.E. A., since 1929 Superintendent of the Sprinkler Department of the Illinois Inspection Bureau, has joined the North America Insurance Companies' special engineering division in the Chicago service office, 231 S. La Salle Street. Mr. Freeman resides at 805 Michigan Avenue, Evanston, Illinois.

Gilson, Samuel R., A.S. L., C.E. L. '26, an engineer and draftsman for the American Metal Bearing Company, 2277 E. 16th Street, Los Angeles, California, resides at 1158 W. 35th Street, Los Angeles.

## 1926

Pierce, Mrs. Forrest E. (Muriel A. Sisson), A.S. L., is Librarian for the Chicago Public Library, 5318 W. North Avenue, Chicago, Illinois. Her residence address is 5732 Washington Boulevard, Chicago.

## 1927

Kern, Charles L., E.E. L., writes he is a 1st Lieutenant with the Ordnance Office at Camp Abbot, Bend, Oregon.

Lund, John H., M.E. A., has been appointed Engineer in Charge of the New Products Department of the Design and Engineering Department of the Elgin Watch Company, Elgin, Illinois. He resides at 363 N. Wo.th Street, Elgin.

## 1928

Payne, Frederick D., F.P.E. A., is State Agent for New York Underwriters Insurance Company, 414 Penway Building, 241 North Pennsylvania Street, Indianapolis 4, Indiana.

Smith, Theodore E., A.A. L., resides at 420 S. Harvard Avenue, Villa Park, Illinois.

## 1929

Shows, Sergeant Warren G., E.E. L., is Somewhere in the Southwest Pacific. His mailing address is: 79th Airdrome Squadron, APO No. 929, c/o Postmaster, San Francisco, California.

## 1931

Murphy, Orland R., E.E. A., attended Lewis Institute for two years and is an Electrical Engineer graduate of Armour Institute. He is with Electrical Windings, Inc., 910 W. Lake Street, Chicago, Illinois, and resides at 1200 Belleforte Avenue, Oak Park, Illinois.

## 1932

Markin, Harry, A.S. L., resides at 747 W. Irving Park Road, Chicago, Illinois.

Saracino, Frank E., E.E. L., is Supervising Engineer for the Chicago Housing Authority, 208 S. La Salle Street, Chicago 4, Illinois. His residence address is 7751 N. Hermitage Avenue, Chicago.

## 1933

Anderson, LeRoy S., F.P.E. A., writes he has been appointed a Lieutenant (j.g.) in the United States Naval Reserve and is to report at Tucson, Arizona, for indoctrination. His home address is 703 N. 24th Street, St. Joseph 34, Missouri.

Fischer, Mrs. George (Sylvia K. Hudik), H.E. L., has moved to 1002 S. 57th Avenue, Cicero 50, Illinois.

Yonker, Mrs. William (Selma H. Reinke), A.S. L., resides at 616 Pearl Street, Sparta, Wisconsin, and writes that her husband is stationed at Camp McCoy nearby.

## 1934

Leiner, Mildred E., A.S. L., now Mrs. R. F. Delano, resides at 5316 Woodlawn Avenue, Chicago, Illinois.

Simon, Richard C., M.E. A., has moved from 4457 N. Paulina Street, Chicago 40, Illinois, to 2110 North Broadway, Santa Ana, California.

## 1936

Alderman, Jerome C., C.E. A., Captain, Corps of Engineers, District Engineer Office, Little Rock, Arkansas, writes:

Recently I was transferred from my previous station at Camp Chaffee, Arkansas, where I served as Area Engineer during construction work at that station.

My new address is given above, and it is requested that it be changed accordingly as I am always quite interested in receiving news from I.I.T.

My new duties are heading the Demobilization Planning Section of the District Engineer Office, Little Rock, Arkansas.

Very truly yours,

J. C. Alderman.

The mailing address for Captain Robert P. Samuels, 0-329907. Arch. A., is 3556 Ord. M.A.M. Co., APO 795, c/o Postmaster, New York, New York.

## 1937

This picture was recently taken at the 7th Annual Reunion of the 1937 Mechanical Engineering Class from the Armour Campus,



Top—Fleissner, Prochaska, Janas, Meyer, Shanahan, Miner, Ruekberg, Rueff.
Middle—Bartusek, Boehme, Harrold, Hlousek, Nieman, Crapple.
Bottom—Wmel, Immekus, Logullo, Blankenship (Blankenship was the M.E. Dept. maintenance man for several years).

The names and business or military addresses of the members of this class can be obtained from the Alumni Office, 79 W. Monroe St., Chicago, Illinois.

Attendance at Our Reunions

| | |
|---|---|
| 1st Reunion, Jan. 8, 1938 | 31 |
| 2nd Reunion, Jan. 7, 1939 | 27 |
| 3rd Reunion, Jan. 6, 1940 | 27 |
| 4th Reunion, Dec. 28, 1940 | 25 |
| 5th Reunion, Dec. 27, 1941 | 22 |
| "First Banquet," Jan. 28, 1942....(couples) | 15 |
| 6th Reunion, Dec. 26, 1942 | 15 |
| 7th Reunion, Jan. 8, 1944 | 18 |

Cowgill, Mrs. Theodore T. (Stephanie Warchalowski), A.S. L., has moved to 1214 S. 51st Court, Cicero 50, Illinois.

Hoffert, Franklin D., Ch.E. A., writes to change his mailing address from the M. W. Kellogg Company, Jersey City, New Jersey, to Hydrocarbon Research, Inc., Olean, New York.

## 1938

Luber, Morton, E., Ch.E. A., F.P.E. A. '40, writes:

Would like to inform you of my whereabouts so that I can again receive the alumni magazine and Technometer. I am now located at the Minneapolis Athletic Club, Minneapolis, Minnesota. Please make note of that so I can get these.

Am with the Fred S. James & Company of Minneapolis as an engineer.

Would appreciate any information you can give me of the whereabouts of Edward J. Pleva, Ch.E. A. '38. The last I had was Officer Candidate School, at Edgewood Arsenal.

Am anxious to contact him.

With best regards, and thanks for your help in the above.

Sincerely,

Morton E. Luber.

Stehman, Captain Harold E., E.E. A., of 16 Columbia Avenue, Park Ridge, Illinois, enlisted in the Air Corps Engineers in May, 1941, receiving his basic training at Chanute Field, Rantoul, Illinois.

After that he was transferred to Tampa, Florida, and then to Lake Charles, Louisiana, where he was made First Lieutenant. From Lake Charles he was sent to Selfridge Field, Michigan, and then to Langley Field, Virginia, before going overseas to England.

Since he has been in England he has met two of his former classmates of Armour Institute of Technology. He writes, "England is a very pretty country, reminds me of Eastern Pennsylvania, on a small scale." He lives with seven other officers and writes that it is really not bad living at all. He has bought a pedigreed Irish terrier which he says is very good company.

## 1939

Spielman, Anna, A.S. L., is now Mrs. David Landsberg, and resides at 1329 W. North Shore Avenue, Chicago 26, Illinois.

## 1940

Alayu, Francisco A., A.S. L., is an Assistant in the Acquisition Department, University of Chicago, 1116 E. 59th Street, Chicago, Illinois, and resides at 5704 Maryland Avenue, Chicago.

Hassell, Vernon J., F.P.E. A., recently wrote from Fresno, California:

Having just received the Institute's message of encouragement by a very roundabout route, it prompts me to drop a few lines in regards to my whereabouts.

Upon completion of the AAF course in Maintenance Engineering, I was commissioned at Yale on August 30th. First location was in Florida with assignment to a Night Fighter Squadron. My time was divided between engineering and supply for the ensuing four and one-half months or so.

KEEPING UP WITH
*Electricity*

**BROADCASTING TIN.** "Flowing" tin plate by induction heating is now accepted practice in the industry. Frequency used in the first installation was 200,000 cycles per second—and the equipment was salvaged from a discarded broadcasting unit! Incidentally, this first installation is still in daily use.

**IT'S A MATTER OF SPEED.** Radium gives out 1,200,000 times as much energy as the same weight of coal burned with oxygen. Even if we had plenty, however, it would probably be a poor substitute for coal, since it releases energy only one-eightieth as rapidly. Nothing that scientists have been able to do has had the slightest effect in speeding up the process.

**THE SUN IS STILL SLOWER,** releasing energy by a process which involves the transmutation of elements and takes between six and seven million years.

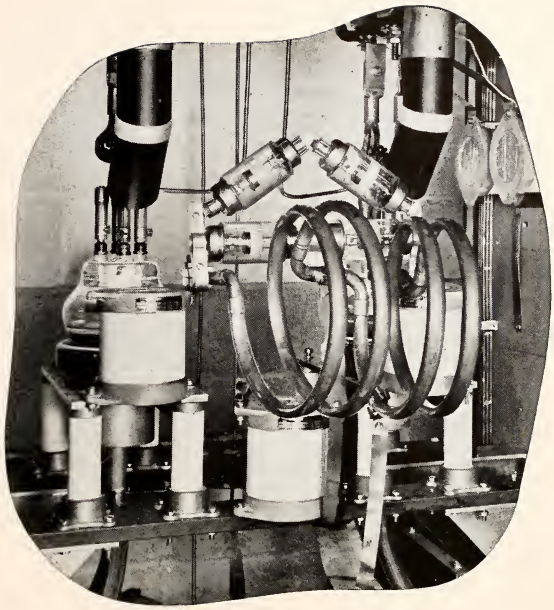
**WOMAN'S WEAPON.** One reason that electric irons aren't being made is that the thermostats used to control their temperature are busy on land, sea and air. They're guarding against motor trouble in tanks, fire danger in planes, overheating in gun equipment on battleships.

**PEAK FLATTENERS.** Resistance welders have speeded up production in thousands of war plants, but they have imposed enormous on and off single-phase loads on power circuits, often building up impossible peak demands. Capacitors are proving to be the answer, correcting the power factor to approximate unity.

**THE HIGHER, THE FEWER** no longer applies in radio vibrators. At high altitudes, vibrator contacts literally "boiled away" in ten hours, hence this type of radio was seldom used in airplanes. New-type vibrator, using Westinghouse-developed materials and techniques, has a life expectancy equal to that of the plane.

• • •

The above items are condensed excerpts from articles in the WESTINGHOUSE ENGINEER, a bi-monthly engineering review. Regular subscription price—$2.00 a year. *Special price to students—50¢.*



# Plastics, plywood and electronics

This is a Westinghouse laboratory set-up for research in dielectric heating—internal heating by high-frequency radio waves. Together with induction heating—surface heating of metals by high-frequency radio waves—this process is daily finding new applications in industry.

One outstanding use of the principle of high-frequency heating is the Westinghouse development of flowing of tin on steel strip. Other important applications are in the bonding of plywood and the curing of plastics.

Dielectric and induction heating effect important savings in time and materials with attendant benefits of better control and more uniform results.

High-frequency heating is an example of electronics at work, another phase of Westinghouse leadership in electricity. Westinghouse Electric & Manufacturing Co., Pittsburgh 30, Pa.

WESTINGHOUSE PRESENTS: *John Charles Thomas, Sunday, 2:30 p.m., E.W.T., NBC. "Top of the Evening," Mon. Wed. Fri. 10:15 p.m., E.W.T., Blue Network.*

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

Our entire unit has recently been moved out here to Hammer Field where I am now acting in the capacity of Personnel Equipment Officer for the Squadron.

Have fortunately received my copies of the Alumnus and Technometer right along and thoroughly enjoyed each one.

Keep 'em coming.

Sincerely,
VERNON J. HASSELL
U.S.A.A.F.
420th N.F. Sq.
Hammer Field
Fresno, California

KREVDICH, WALTER, E.E. A., writes his residence address is 2111 E. 67th Street, Apt. No. 4, Chicago, Illinois.

## 1941

FLASKAMP, PAUL K., A.S. I., wrote from Tampa, Florida, under date of January 26th, the following interesting letter:

I just want to write a short letter informing you of my change of address and telling you how much I appreciate your sending me a copy of the Illinois Tech Engineer. As my wife is also a Lewis alumnus, we both enjoy it immensely. At present it is our only source of news of our fellow classmates. Perhaps it would be of interest to the Alumni Section that Lola Schlagel, L. '42, of Des Plaines, Illinois, and I were married here in Tampa on September 17, 1943. At the present time we have made our home here, but are both anxious to return to Chicago. After all, there's no place like home.

KEY, EUGENE G., A.S. I., brings his record up-to-date with the following:

1 am an Arts and Science product, 1941. Here are two bits of news, which I am sure will interest the Technometer, and possibly other departments.

1. On the 15th of February, 1944, I became the father of an 8-pound boy named Linford Eugene Key. Both the Technometer and the Illinois Tech Engineer and Alumnus reported my marriage wedding of May 8, 1943, to a W.A.A.F. from Belfast, Northern Ireland. She was born in Ranchi, India. Her name was Winifred Rachel Abrahall. Linford thus becomes one of the first babies born on American soil to an American soldier and a British (Irish) wife as the result of a wartime marriage, which took place overseas. As you know, only a few British women have been admitted to the U.S. during wartime.

2. The second bit of news is that on March 10, 1944, I was promoted from 1st Lieutenant to Captain. I know this will be news to you as the Technometer is still being addressed to "2nd Lieutenant Key," although I became a 1st Lieutenant on July 22, 1943. I have been in the army since July 1, 1942. My new and correct address is:

Captain Eugene G. Key, 0-478712
Box 875, Hq. Air Service Command
Patterson Field, Ohio

Best wishes, and may I hear from you soon.

As ever,
EUGENE G. KEY.

MATTHEWS, PFC GEORGE J., E.E. I., reports his new address is: Detach. C., Bks. T-353, Pvg. Gnd. Det., Aberdeen Proving Ground, Maryland.

## 1942

BUNCE, HOBART B., E.E. I., reports a new address: 7506 Kensington Street, Pittsburgh 21, Pennsylvania.

LIEUTENANT (j.g.) EUGENE T. CLEARS, E.E. I., of the United States Naval Reserve, is a Junior Consulting Radar Engineer at Pearl Harbor. His home address is 6334 N. Francisco Avenue, Chicago, Illinois.

GROTE, WM. J., C.E. I., is a Naval Architect working in the Navy Department on maintenance of aircraft carriers, Bureau of Ships, 16th & Constitution, Washington, D. C. He resides at 1815 S. Fern Street, Arlington, Virginia.

Stationed at Oklahoma City Air Depot, Tinker Field, Oklahoma is 2nd Lieutenant HOWARD JARNIY, M.E. I., formerly of 1130 Pratt Boulevard, Chicago, Illinois. He is Assistant Maintenance Officer at this model establishment of the Air Service Command for the maintenance and repair of aircraft and the training of air depot groups. Prior to entering the Service, Lieutenant Jarmy was employed as Assistant Aircraft Maintenance Supervisor at Patterson Field, Fairfield, Ohio.

SAPERSTEIN, SEYMOUR, M.E. I., writes from Labrador:

Just a few lines to let you know I have been receiving the Technometer up here, and find it an interesting link with the events taking place at good old Armour.

There is a slight change in my address, which you may note from the envelope.

I am looking forward to the next issue of the alumni magazine.

Sincerely yours,
SEYMOUR SAPERSTEIN
1st Lieutenant, Air Corps
Base Technical Inspector
Station No. 4 NAW-ATC
APO 677, Presque Isle, Maine

SPITZ, WARREN E., Arch. I., is now a Lieutenant (j.g.) in the United States Naval Reserve, and his mailing address is Comphibtrapac, Fleet Post Office, San Francisco, California.

TACHAU, HERMAN, C.E. I., is now employed by the Chance Vought Aircraft Company in the Structures Department. His mailing address is c/o Mrs. Brown, 273 Housatonic Avenue, Stratford, Connecticut.

## 1943

APITZ, MIOSHIPMAN RUSSELL F., M.E. I., is attending the U.S.N.R. Midshipman's School, section No. 1, at Notre Dame, Indiana.

CLARK, WILLIAM G., Ch.E. I., of 619 Prospect Street, Elmhurst, Illinois, graduated February 2, 1944 from the Naval Air Training Center, Corpus Christi, Texas, and was commissioned an Ensign in the United States Naval Reserve.

ELKE, ROY F., F.P.E. I., writes on a tracer post-card recently sent him that he has spent the past four and one-half months in Colombia, T. H. He is a Flight Engineer for the Pan American Airways, Treasure Island, San Francisco, California, and resides at 915 Creed Road, Oakland, California.

FUCHSSTEINER, CLYDE L., M.E. I., received his commission as an Ensign in the United States Naval Reserve on February 24, 1944, at Columbia University, New York. Ensign Fuchssteiner is now studying Diesel Engineering in Flint, Michigan, and Mrs. Fuchssteiner has gone to Flint to be with her husband.

MCCLENEGHAN, BERT W., M.E. I., is Sales Engineer for the John S. Barnes Corporation, 301 S. Water Street, Rockford, Illinois, and resides at 1125 School Street, Rockford.

MURBIN, JR., LIEUTENANT JOHN F., M.E. I., is a Flying Instructor for the Army Air Force. He resides at 232 Colonial Drive, Hanford, California.

PALM, EDGAR H., M.E. I., is employed as a trainee by the Crane Company, 4200 S. Kedzie Avenue, Chicago, Illinois, and resides at 1400 E. 53rd Street, Chicago.

## 1944

A/C WARREN F. MOORE, Cadet Reg., Class 10A, USNATC, Corpus Christi, Texas, M.E. I., writes:

My copies of the "Technometer" have provided me with a great deal of enjoyment during my leisure hours. It is good to know of some of the things in progress back home at the Institute. Please accept my thanks for remembering me each month with a copy.

Some time ago I mailed you a change of address which must never have reached you. Although I have been receiving my copies, they have been traveling all over the Middle West enroute. In lieu of this, I suggest you send them to my home and they will be forwarded to me wherever I am.

Thanking you in advance, I am

Sincerely yours,
WARREN F. MOORE,
Home Address:
6541 Harvard Avenue
Chicago, Illinois

THORNTON, LIEUTENANT JOHN C., M.E.I., who shot down three Zeroes in one combat, cabled his parents, Mr. and Mrs. John C. Thornton, 1345 W. Estes Avenue, Chicago, Illinois, not to worry, since he was resting. Lt. Thornton has completed two six-week periods of combat flying, and, after he finishes the third, his family expects him home some time in June.

Lt. Thornton left the Illinois Institute of Technology to enlist in the Navy Air Force in September, 1941. After training at Glenview, he transferred to the Marine Air Force and won his wings at Pensacola in January, 1943. He went overseas in April, and on his first trip into combat last November shot down a Zero.

## 1945

GERLEMAN, KENNETH F., Ch.E. I., writes his training as a cadet has been most enjoyable, and that he expects to graduate from an Advanced Flying School shortly and receive his commission. His address is:

A/C Kenneth F. Gerleman (16139079)
Class 44-D, Box 913
P.A.A.F.
Pecos, Texas

HUBER, RICHARD H., E.E. I., writes his address is now: R. H. Huber, RT 3/C, U.S.S. Fremont APA 44, "N" Division, c/o Fleet Postoffice, New York, New York.

## 1946

The Alumni Office recently enjoyed a very pleasant visit from Apprentice Seaman ECKHARDT W. KAYSER, A.S. I., who was home on leave and is now attending the United States Naval Training School (V-12), Company 4, at the University of Louisville, Louisville, Kentucky.

# ENGAGEMENTS

Announcement has been made by Dr. and Mrs. Walter B. Schindler of 118 S. Carbon Street, Syracuse, New York, of the engagement of their daughter, Miss Jayne Schindler, to Lt. GEORGE P. HANNA, JR., U.S.A., C.E. A. '40, son of Mr. and Mrs. George P. Hanna of Woodlake, Nebraska. A graduate of Armour Institute of Technology, Lt. Hanna received a master's degree from New York University. While in college he was a member of Triangle, civil engineering fraternity, Beta Nu, and Tau Beta Pi. The wedding will take place in June.

# MARRIAGES

## 1929

STELLAR, RAYMOND F., C.E. A., married Ensign Edith Roberta Andruss of the Waves, April 10, 1944, in Washington, D. C. Mr. Stellar, a graduate of Illinois Institute of Technology, is a member of Alpha Sigma Phi, and also of Tau Beta Pi and Chi Epsilon honorary fraternities. At present he is a civil engineer in the office of the Chief of Engineers of the U. S. Army.

## 1943

LT. JULIAN R. KAHN of the U.S.A.A.F., M.E. I., recently married Betty Ann Stranss at the Windermere East Hotel, Chicago, Illinois. Lieutenant Kahn has just received his pilot's wings.

# BIRTHS

## 1940

A unique birth announcement was received by the Alumni Office. It was a book called "Baby Dear" and read as follows:

We're the authors of a little Gem
Entitled "Baby Dear"
And though we could write you "volumes"
We'll condense the plot right here!
Main Character: Cheryl Ann.
Arrived on scene: Jan. 20, 1944.
At St. Francis Hospital.
Weight: 5 lbs. 13½ ozs.
Author's names:
Robert Maxwell, F.P.E. A. '40 and
Mrs. Martha Maxwell.

# OBITUARIES

## 1900

FISCHER, CHARLES H., E.E. A., passed away in December of last year, at the age of sixty-four. Mr. Fischer, prior to his death, was a consulting fire protection engineer, with offices at 111 John Street, New York, New York. A native of Chicago, he joined the Chicago Board of Fire Underwriters after graduating from Armour Institute of Technology as an electrical and fire protection engineer. He was associated with the Texas Inspection Bureau before he became an engineer with the National Board of Fire Underwriters.

He left the National Board to go to Milan, Italy, where he became American deputy consul. During his stay in Italy, he made a study of European fire losses, fire hazards, and public protection problems. Returning to the United States after four years at his post, he became superintendent of the engineering department of the Schedule Rating Office of New Jersey. As a consulting engineer he specialized in petroleum properties and was active on several committees of the National Fire Protection Association. He leaves his wife, Mrs. Elise Peeler Fischer.

## 1912

STRALE, NELS W., M.E. A., Chief Engineer of Muskegon Boiler Works, Muskegon, Michigan, passed away on January 25, 1944.

## 1914

HALLSTEIN, WALTER H., C.E. A., passed away in January of this year. He resided at 518 Kenilworth Avenue, Kenilworth, Illinois.

## 1917

BOST, MRS. WILLIAM D. (BERNICE CHALLENGER), D.E. L., of 1254 Lake Shore Drive, Chicago, Illinois, passed away on February 4, 1944. She was a radio commentator and former editor and publisher of several Chicago community and club magazines.

## 1919

ENGH, IRVING M., C.E. A., died on March 9th at Colorado Springs, Colorado. His home was in Edinboro, Pennsylvania.




# NEW VISIONS for Tomorrow's World

● IT DOESN'T MATTER NOW whether clouds hide the sun, or whether evening shadows fall on the baseball diamond. If the fans in the grandstand see the game so can the modern television camera.

That was not always so; the pre-war television "eye" needed as much sunshine as it could get to illuminate the scene. The same was true of football—final quarters were occasionally "washed out" on the television screen.

But thanks to research, conducted at the RCA Laboratories, a new super-sensitive television camera, rivaling the human eye in its ability to see under conditions of poor light is in prospect for the post-war world. Then, by television you will see every last-minute play of the ball game as clearly as if you were in the stands. Entertainment, sports, news events will pass before your eyes with every detail, every shadow faithfully reproduced.

Today, RCA's research facilities are devoted to providing the fighting forces of the United Nations with the best radio and electronic equipment available. Tomorrow, these same skills will continue to serve America in developing and creating new and finer peacetime products.



**RADIO CORPORATION OF AMERICA**
RCA LABORATORIES • PRINCETON • NEW JERSEY

RCA leads the way in radio—television—electronics

RCA

TUNE IN! . . . RCA's great new show, 7:30-8:00 P.M. EWT, over the Blue Network, every Saturday ★ BUY WAR BONDS EVERY PAY DAY ★

## TECH MEN, IF YOU ARE INDUCTED

If you are inducted into the United States Armed Forces, it may be of advantage to you to show a copy of your orientation test scores to the officer who classifies you for your place in the service.

The reason for this is that many classification officers have been school men and are familiar with the standard tests employed so frequently in education. They will be familiar with our orientation tests since, with the exception of one locally prepared test, all given at the Armour College of Engineering are the very best standard ones that can be obtained. The moment such an officer sees your score on an examination, it means something very definite to him. Possibly it may mean more to him than your score on the Army General Classification Test. Even if your classification officer has not been engaged in civilian life in the educational field, his army training should have made him familiar with the use of tests.

For this reason it is suggested when you have your interview with a classification officer that you bring with you and show to him the scores you received on your orientation tests. These scores will be given in terms of national norms, which all people working with tests understand. Maybe he will read them—maybe he will not. In any case it cannot do you any harm and it may do you some good.

To get your test scores, send your request to:

W. C. Krathwohl, Illinois Institute of Technology, Department of Educational Tests and Measurements, 3300 Federal Street, Chicago 16, Illinois.

Give us the approximate date when you took the tests. If we think your scores are too low to do you any good we will be honest and tell you so, hoping that your feelings will not be hurt. They should not be because everyone ought to know that an individual does not have to have a high test score to make a success of himself in life.

If you are not sure that your orientation test scores are on file in this office, the following dates will help. Orientation tests were given to entering freshmen only: in September 1936, February 1937, or April 1937. Since September 1937, both freshmen and students entering with advanced standing have taken them. The entrance examinations given cooperative students are not classed as orientation tests.

You may have already been inducted but think that a record of these test scores might be of help to you. If so, write for them. We want to help every one of our students in every way that we possibly can.

William C. Krathwohl.

## PHYSICAL TRAINING

(From page 14)

back to where we were before the programs were put in force at the Institute would be a definite mistake. I am sure that all who have come in contact with these programs will agree that they are among the best things which have developed at the Institute in many years.

Much of the success of these programs is due to the high caliber of the personnel who have handled the various activities. The Navy has sent on some of its best specialists to keep its program moving and they have done a remarkable job. The civilian personnel who have operated in the programs alongside the Army and Navy officials have also done good work. I sincerely feel that we here at the Institute have promoted one of the best programs of physical fitness in the country.

## BUSINESS SUBJECTS

(From page 16)

if the same unions limit their membership and enforce wages so high that the entrepreneur finds it advisable to decrease production, it should be obvious to all that another monopoly has been formed. But is it clear to most people? Apparently, it is not. Do engineers need to understand simple principles of investment? If they save anything, they become investors. Therefore, they should understand bonds, common stocks, preferred stocks, real estate, effects of interest rates upon valuation, and many other things too numerous to consider here. The conclusion is that a knowledge of the fundamentals of business subjects, especially of economics, will aid the citizen in living more intelligently and more helpfully with respect to his fellow-men.

There is no assumption in this article that engineers cannot profit by an education in languages, political science, et cetera. The argument is simply that engineers should study business subjects because a knowledge of the fundamentals of those subjects is a necessity to those who become executives, and a great aid to those who do not wish to be executives, and helps all to become more intelligent citizens. Perhaps such an education would aid engineers in avoiding the tacit assumption that material gain and self-gratification are the motivating forces of all human conduct. Is this expecting too much? Certainly, a study of economics, under the leadership of well-educated and skilled teachers, will cause the student to think carefully about many of the topics mentioned in this article.

## RECENT CONFERENCES

(From page 24)

Bailey of the Commonwealth Edison Company, Chicago, and Mr. A. R. Mumford of the Combustion Engineering Company, New York, respectively discussed "Postwar Planning of the Nation's Power Supply" and "Research in Fuels as a Postwar Necessity," while Mr. B. W. Clark of the Westinghouse Electric and Manufacturing Company, East Pittsburg, talked of "Tomorrow's Outlook" at the second luncheon.

Sanford B. Meech.

## THE A.S.M.E. STUDENT CONFERENCE

The Illinois Institute of Technology Student Branch of the American Society of Mechanical Engineers, in cooperation with the branch at Northwestern University, was host on April 14-15 to the twelfth annual Student Conference, comprising Groups VIII, XI, and XII of The American Society of Mechanical Engineers. The purpose of the conference was to develop friendship among the students of Midwestern schools and to give them an opportunity to present technical papers in competition for prizes.

The conference was attended by a surprisingly large number of students (230), who came from places as far distant as the University of Minnesota. The registration statistics showed Illinois Tech to be represented at the conference by 162 young engineers. Other participating institutions registered attendance as follows: Northwestern University, Evanston, Illinois, 20; Rose Polytechnic Institute, Terre Haute, Indiana, 8; Marquette University, Milwaukee, Wisconsin, 6; Notre Dame

## *FOR SPEEDIER TRANSPORTATION—MAGNESIUM WILL PERMIT NEW LOW COSTS AND INCREASED PAY LOADS*

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Magnesium is the lightweight champion of the mighty Allied air fleets today. You will soon come to recognize it in sleek streamliners and soaring air transports. For with Magnesium, designers are now planning to cast off the anchor of dead weight. In its place will appear greater fuel capacity to increase range and speed—larger cargo space to increase pay loads. Operating efficiency will go up—operating costs will go down—and the *things that move* will "lighten up" with Magnesium.

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THE METAL OF MOTION

University, South Bend, Indiana, 5; Michigan College of Mining and Technology, Houghton, Michigan, 6; Purdue University, West Lafayette, Indiana, 5; University of Wisconsin, Madison, Wisconsin, 4; University of Minnesota, Minneapolis, Minnesota, 5; Iowa State University, Iowa City, Iowa, 2; Iowa State College, Ames, Iowa, 3; and University of Illinois, Urbana, Illinois, 4.

The meeting was held at the Rosenwald Museum of Science and Industry. The first session opened with an address of welcome by Dean J. C. Peebles, of the Illinois Institute of Technology, who spoke briefly on the benefits to be gained by engineers who continue to keep in the forefront of their profession by attending meetings of the society and by keeping up their contacts and friendships with other engineers.

Mr. John P. Magos, Chairman of the Chicago Section of the American Society of Mechanical Engineers, spoke to the students regarding the excellent training for a successful career in engineering which the writing and presentation of technical papers offered.

The papers presented at the two technical sessions were of exceptionally high calibre, making it very difficult for the judges to decide the winners. First prize of fifty dollars was awarded to William W. Wachtl, of the University of Wisconsin, for his excellent paper on "Instrumentation in Diesel Combustion." In his paper Mr. Wachtl described several devices which he had helped to develop for measuring the temperature and pressure at any instant within a Diesel engine cylinder.

Following the technical sessions, a luncheon was served at the museum for all guests of the conference. At this luncheon, Professor Herbert Kuenzel, of Washington University, St. Louis, spoke as the official representative of the A.S.M.E. Committee on Relations with Colleges. Mr. Thomas S. McEwan, President of the Chicago Technical Societies, representing the President of the American Society of Mechanical Engineers, awarded the prizes to the winning students.

The success of the conference was largely due to the excellent work of the Honorary Chairman, Professor J. S. Kozacka, of Illinois Institute of Technology, and to the officers of the Student Branch, of which Clarence B. Puchalski is Chairman.

Roland A. Budenholzer.

## HONORARY DEGREES

(From page 25)

and development. When the Technical Division of the Office was established on July 1, 1942, he became its chief. He was sent to England in August of that year as head of a technical mission, and visited Egypt and the North African Front in the following December and January.

CHARLES LAWRENCE BOLTE, Major General, United States Army, Commanding General 69th Infantry Division, was cited. "For contributions to military science in the field of tactics, operations, and logistics . . .; for his organizing ability demonstrated in the early phases of this war; and for his leadership as a Major General in this critical moment of America's military effort."

General Bolte, like General Barnes a veteran officer of the United States Army, has an especial claim upon our interest as an alumnus of Armour Institute, Ch.E '17. His distinguished career won him the nomination as "Man of the Month" in the issue of the *Engineer* of March, 1942.

He earned a reserve commission as Second Lieutenant by attending training camps in the summer vacations of his college years. Called to service in the Regular Army, he went overseas with the Fifty-eighth Infantry of the Fourth Division in May, 1918, took part in the Aisne-Marne, St. Mihiel and Meuse-Argonne engagements, was wounded three times, but recovered in time to enter Germany with the Army of Occupation. After five years service at San Antonio, Texas, following the war, he proceeded to the infantry school at Fort Benning as instructor in the tactics section, and in 1930 attended the command and staff school at Fort Leavenworth, Kansas. Three years duty with the Fifteenth Infantry in Tientsin, China, followed and then an assignment with the Thirteenth Infantry at Fort Devens, Mass. Graduating from the Army War College in Washington, D. C., he was appointed a member of its faculty and served in that capacity for several years. He was subsequently put in charge of plans and training at Camp Blanding, Jacksonville, Fla. After this tour of duty, he was sent to London as Plans Officer of the Special Observers Group. From May 1, 1941, to June, 1942, he served as Chief of Staff in the European Theater of Operations. For his work as plans officer and as chief of staff he has been awarded the Legion of Merit.

CHARLES FREDERICK BURGESS, President of the Burgess Battery Company, was cited "For his inventive genius . . . in particular, as inventor of the process for electrolytic purifications of iron and other electrochemical processes; and as an administrator whose tireless efforts have contributed to the industrial development of this country."

President Burgess, Wisconsin born, received the degree of Bachelor of Science in Electrical Engineering and that of Electrical Engineer from his State University in 1895 and 1897 and taught there from 1895 to 1913.

He left the academic world in 1913 to devote his entire time to an industrial career. Three years before, the laboratories which bear his name, had been incorporated. The rapid growth of the manufacture of dry cells which they had started led to the incorporation of the Burgess Battery Company in 1917. Other companies in which he has been a moving spirit are the Burgess-Parr Company, producing corrosion resistant alloys; the Burgess Cellulose Company, manufacturing stereotype mats; the Burgess-Manning Company, turning out engine intake and exhaust silencers and other sound-deadening constructions, the Thordardson Electric Manufacturing Company, producing transformers; and, in Great Britain, the Burgess Products Company Limited and the Burgess Zeolite Company Limited.

Dr. Burgess, the writer of many technical papers and the holder of some sixty patents, has been awarded the Octave Chanute Medal by the Western Society of Engineers (1911), the Perkin Medal by the Society of Chemical Industry (1932), and the Goodrich Acheson Medal and Prize by the Electrochemical Society (1942). His Alma Mater gave him a doctorate in 1926.

JAMES DALTON CUNNINGHAM, President of the Republic Flow Meters Company, was cited "For unselfish service to engineering education through his vision and leadership, and for his ability as an engineer, executive, and civic leader . . ."

Mr. Cunningham, who is known to all connected with the Institute as the able and indefatigable Chairman of its Board of Trustees, has been prominent in the business life of Chicago for many years. Graduating from the Hyde Park High School in 1905, he began his industrial career as a clerk in the Armour Glue Works. He was a member of the firm of the Clyde Machine Works Company from 1909 to 1911. In the latter year he founded the Steam Appliance Company, of which he was made President. This later became the Republic Flow Meters Company. He has also served as President of the Autogas Corporation and of the Smoot Engineering Company, and has become a Director of




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the Lumberman's Mutual Casualty Company.

During the First World War, he served as a Lieutenant in the Air Service of the U. S. Army.

He is a member of the American Society of Mechanical Engineers, the Western Society of Engineers, the Illinois Manufacturers Association, and the National Association of Manufacturers. He was made a member of the advisory board of the Illinois Manufacturers Association and a director of the National Association.

WILLARD HENRY DOW, President of the Dow Chemical Company, was cited "For major contributions to the production of magnesium, synthetic rubber, bromine from sea water, phenols, and other vital products used in war and in peace, and for an executive genius in chemical engineering, organic chemistry, and electro-chemistry . . ."

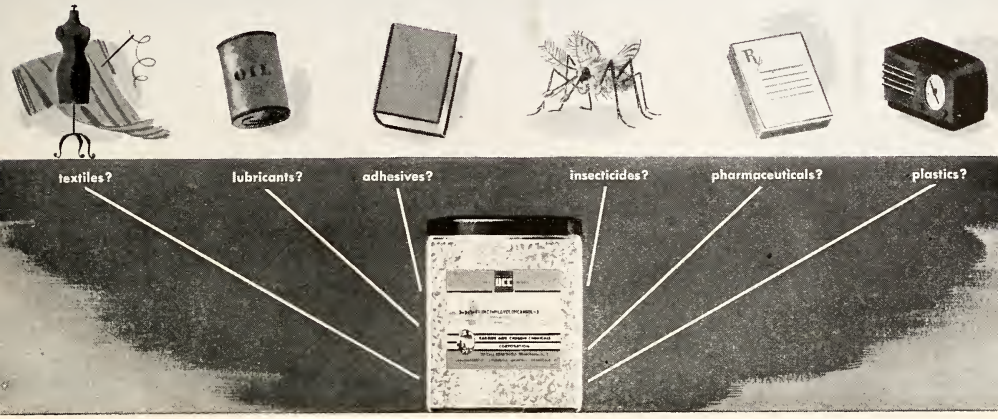
Dr. Willard H. Dow was born in Midland, Michigan in the same year (1897) that the Dow Chemical Company was formed there by his father, Dr. Herbert H. Dow, and some of the latter's associates.

The son, a veteran of the first world conflict, went to work in the Midland factory in 1919, the year of his graduation from the University of Michigan with the degree of Bachelor of Science in Chemical Engineering. He was made a Director of the Dow Chemical Company in 1922, Assistant General Manager in 1926, and, on his father's death in 1930, President and General Manager.

Under his leadership the Dow organization has branched out extensively and successfully. Dowell Incorporated was established in 1932 to acidize oil wells confronted with decreasing flow. The Ethyl-Dow Chemical Company was formed in 1933 in Wilmington, North Carolina, to extract bromine from the ocean by a new method, which produces ethyl bromide used in ethyl gasoline. The Jones Chemical Company, established in 1928 to make iodine, was reorganized in 1934 as the Io-Dow Chemical Company (California). In 1935, the Dow interests took over the plant of the Cleveland-Cliffs Iron Company at Marquette and are now manufacturing in it, under the name of Cliffs Dow Chemical Company, various chemical products devised from wood. In 1938, the Great Western Electro-Chemical Company was merged into the Dow Chemical Company as its great Western Division (California), and now produces large quantities of liquid chlorine, caustic soda, xanthates, hydrochloric acid, ammonia, and many other lines of heavy chemicals. To fulfill government contracts, the Dow

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EVEN *we* know only a little of what you might do with it... yet. Trimethylcyclohexanol (you pronounce it try'-meth'-il-sy'-klo-hex'-an-ohl) is a new industrial chemical by CARBIDE AND CARBON CHEMICALS CORPORATION... made with atoms obtained from common substances, rearranged into molecules that are not known to exist in nature.

What's this new synthetic organic chemical good for? No one yet knows all of the useful things it might be made to do. If you are technically minded you'll find some of the facts so far discovered in the italicized paragraph at the right. Whatever your interest, you will be glad to know that this new chemical has potential uses in the making of such things as medicines, plastics, lubricating oils, and adhesives.

In their service to industry as incubators for raw materials, the laboratories of this Unit of UCC are continually developing such new chemicals. An almost predictable percentage of them prove to be extremely valuable. Out of hundreds already developed have come scores from which scientists in industry have developed useful products of many kinds.

Some of the chemicals are used to make superior anti-freezes. Others are raw materials for quantity production of vitamins and life-saving drugs. Still others make possible improved cosmetics, plastics, textiles, photofilm, insect repellents, anesthetics... and hundreds of things of benefit to you in your daily life.

Through continuing research which is developing new materials out of common substances, CARBIDE AND CARBON CHEMICALS CORPORATION is helping to make many things more plentiful or more useful. And the research of this one Unit... in that field which often must appear to the layman as "unknown chemicals"... gives you an idea of what the combined research of all UCC Units in many basic fields means to you.

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*Model of Molecule of Trimethylcyclohexanol*

*As Trimethylcyclohexanol is one of the newest additions to this family of synthetic organic chemicals, its story is still incomplete. It is an alcohol with a high boiling point (388° Fahrenheit). At room temperature, it is a white solid with an odor like menthol. It dissolves in other alcohols, gasoline, benzene, ethers, and vegetable oils like linseed oil, but does not dissolve in water. It can be supplied in carload quantities if and when the need arises.*

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Magnesium Corporation was set up in 1941 and the Styrene Division in 1942. The Dow organizations are producing about 60% of the country's magnesium and about 50% of its styrene. Dow Chemical of Canada Limited was formed in 1942.

In recognition of his important contributions to industrial progress, Dr. Dow was made an honorary Doctor of Science by the Michigan College of Mining and Technology in 1939, and an honorary Doctor of Engineering by the University of Michigan in 1941, and was named Chandler Medallist by Columbia University in 1943.

EDWARD CHARLES ELLIOTT, President of Purdue University, was cited "For distinguished service as an educational administrator in the fields of fundamental and applied science, and as an author, lecturer, trustee, and adviser . . .; and for statesmanlike leadership in education during the present period of national distress."

In his long educational career, Dr. Elliott gained a wide background of direct experience ranging from teaching in high school to heading a major university. Although born in Chicago, he got his college training at the University of Nebraska, where he earned the degrees of Bachelor of Science in 1895 and of Master of Arts in 1897. He did high school teaching in 1897-98 and was superintendent of schools in Leadville, Colorado, in the years 1898-1903. He instructed at Teachers College, Columbia, from 1903 to 1905, receiving the degree of Doctor of Philosophy in the latter year. He was at the University of Wisconsin from 1905 to 1916, rising from associate professor of education to director of the course for teacher training. He was called to the University of Montana as its Chancellor in 1916, and to Purdue as President in 1922.

President Elliott has been in great demand as an educational adviser. Educational societies and foundations as well as municipalities, states, and the Federal Government have come to him for counsel.

He has been a member of many important committees in his capacity of educational expert. He served as President of the Department of Higher Education of the National Education Association in 1917 and as Chairman of the American Council on Education in 1937-38.

Butler, Columbia, De Pauw, Oregon Agricultural College, the University of Indiana, and the University of Nebraska have conferred the degree of Doctor of Laws upon him and Hahnemann Medical College, that of Doctor of Humanities.

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Whatever your needs, our experienced wood engineers are ready to match them with a big stock of practical, economical, tested ideas—and the equipment to carry them out.

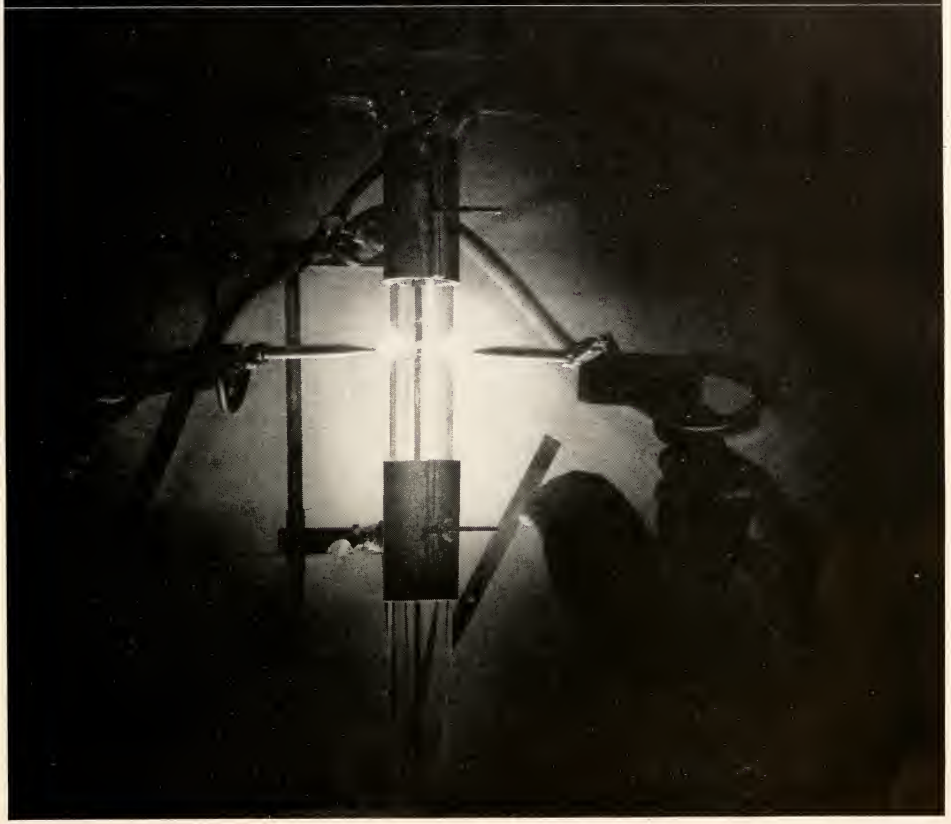
Now that metals are at war, may we put wood to work for you?

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FOR a long time industry has wanted a method by which two or a thousand pieces of glass pipe could be joined into a continuous piece. Corning has worked out a high-frequency electrical welding process that literally sews glass with fire.

It has these advantages: 1) It's faster than old methods. 2) It makes a smooth, transparent joint, just as strong as the pipe itself. 3) With the new portable welding equipment it may soon be possible to go into a food or chemical plant and install continuous glass piping right on the job.

Welded glass pipe isn't available now except to certain war plants. But it's another interesting development that points to a greater use of glass when some of the present restrictions on production are behind us. Others are a new type of glass so resistant to thermal shock that it can be heated cherry red and then sprayed with ice water without breaking; "ribbon glass" in sheets almost as thin as cellophane; and a new method by which accurate shapes of almost any size or description never before possible in glass can be quickly formed. Glass is going to play a major role in post-war. And Corning will be there with what it has learned during the war plus a background of nearly a century of glassmaking experience. You can count on it. Glass, the material with a sparkling future, will keep full pace with your own sparkling future as an engineer. Corning Glass Works, Corning, N. Y.

CORNING
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Research in Glass

ways, Chicago, was cited "For pre-eminent contributions to engineering construction as a public servant of the City of Chicago, and as the engineer and administrator who directed the design and construction of the city's subways, and whose plan for superhighway construction will shorten the period needed for its accomplishment."

Commissioner Harrington, a Chicagoan from the age of six, graduated from Armour Institute as a Bachelor of Science in Electrical Engineering in 1906. He served as student assistant in the electrical laboratory and was active in sports and the affairs of his class.

For twenty-nine years after his graduation, he was on the engineering staff of the Sanitary District of Chicago, beginning as a rodman on topographic surveys of the Illinois river, and advancing to Chief Electrical Engineer (1923), Assistant Chief Engineer (1924), and finally to Chief Engineer (1933). In this long period, he actively planned and directed heavy construction projects costing over $100,000,000, including bridges, canals, power houses, pumping stations, sewers, and the largest sewage treatment system in the world.

Resigning as Chief Engineer of the District in 1935, to accept the post of transit adviser to the City of Chicago, he embarked on a second career which was to bring him even greater distinction than his first. In 1937, his *Comprehensive Local Transportation Plan for the City of Chicago* was accepted by the City Council. This led directly to the inception of the subway project, financed by the city and the Federal Government, an important first step in giving Chicago a fine modern system of local transportation. Mr. Harrington was appointed Commissioner of Subways and Superhighways on January first, 1940. The first unit of the subway system now in its eighth month of successful operation, is an outstanding monument to American engineering skill. To further his aim of improving Chicago's transit system, Commissioner Harrington has recently published a report proposing municipal acquisition of the Chicago Surface Lines and the Chicago Rapid Transit Company for $86,000,000.

Commissioner Harrington was given the Distinguished Service Award of the Armour Alumni Association at the annual meeting, June eighteenth, 1942, and he was nominated as the "Man of the Month" in the issue of the *Engineer* of October, 1942.

GEORGE WILLIAM LEWIS, Director of Aeronautical Research, National Advisory Committee for Aeronautics, was cited "For outstanding achievement in advancing our knowledge of the fundamental principles and practices of mechanical flight; and for leadership and encouragement of practical research by our Government in cooperation with industry. . ."

Dr. Lewis, a native of Central New York, was educated at Cornell University from which he received a Bachelor of Science degree in Mechanical Engineering in 1909. He taught at Swarthmore College from 1910 until America's entrance into the World War, when he resigned in order to devote himself to aeronautical research.

His long association with the National Advisory Committee for Aeronautics, which had been established by Congress in 1915 to supervise, direct, and conduct the scientific study of the problems of flight, began in 1919 when he was appointed its Executive Officer. Under his leadership as Executive Officer and later (1924) as Director of Aeronautical Research, the Committee has established three

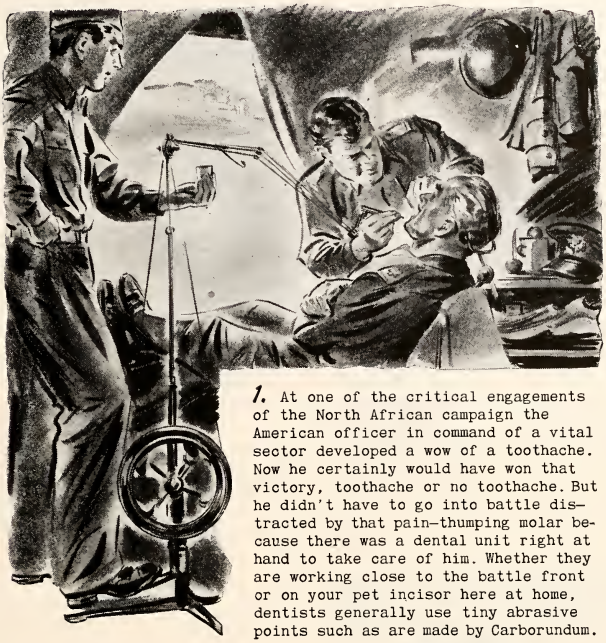

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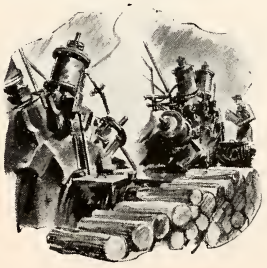
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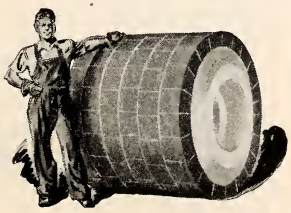
# An African Victory that might have hung by a tooth!



*1.* At one of the critical engagements of the North African campaign the American officer in command of a vital sector developed a wow of a toothache. Now he certainly would have won that victory, toothache or no toothache. But he didn't have to go into battle distracted by that pain-thumping molar because there was a dental unit right at hand to take care of him. Whether they are working close to the battle front or on your pet incisor here at home, dentists generally use tiny abrasive points such as are made by Carborundum.

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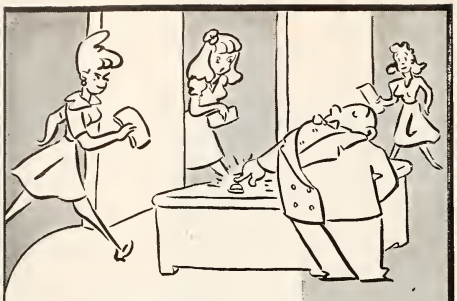




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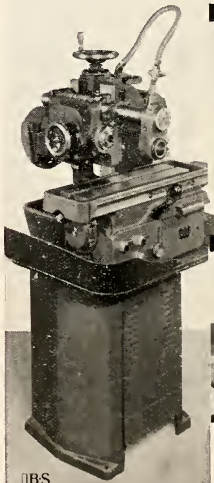
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Many honors have come to him. The American Society of Mechanical Engineers named him in 1929 as one of the ten men most responsible for advances in aeronautical science in the United States. Norwich University made him an honorary Doctor of Science in 1934. Two years later he was awarded the Guggenheim Medal by the Institute of Aeronautical Sciences. And in 1939, he was President of the Institute of Aeronautical Sciences.

SOREN HANSON MORTENSEN, Chief Electrical Engineer of the Allis-Chalmers Manufacturing Company, Milwaukee, was cited "For distinguished leadership in the development of alternating current machinery and rectifiers and the extension of their applications; and for his contributions to the design of synchronous motors and generators and his pioneering research in the development of self-starting synchronous motors and condensers."

Dr. Mortensen, who was born in Denmark and who studied engineering in Europe before coming to this country, has been with the Allis-Chalmers Company since 1905. He has held the positions successively of electrical draftsman, design engineer for direct current machines, design engineer of rotating synchronous machines, engineer-in-charge of alternating current design, and, since 1942, chief electrical engineer.

Dr. Mortensen is the author of numerous articles and technical papers in the leading professional journals, of a textbook on electrical machines, and of the section on synchronous generators in the new edition of the *Standard Handbook for Electrical Engineers* (McGraw Hill).

JAMES ALOYSIUS RAFFERTY, President of the Carbide and Carbon Chemicals Corporation, was cited "For his engineering ability, industry, vision, and leadership displayed in the organization and direction of one of America's greatest chemical enterprises; and for his pioneering skill, which, starting with little-known processes and unknown products, has helped to open new horizons in the world of chemistry and to create an entirely new industry."


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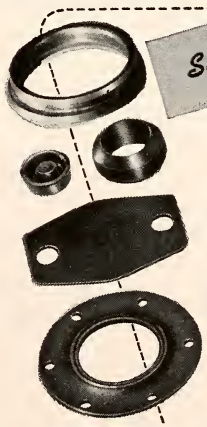
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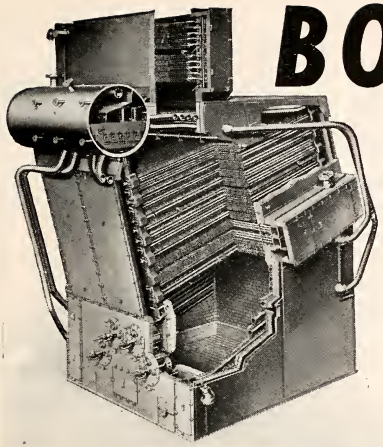
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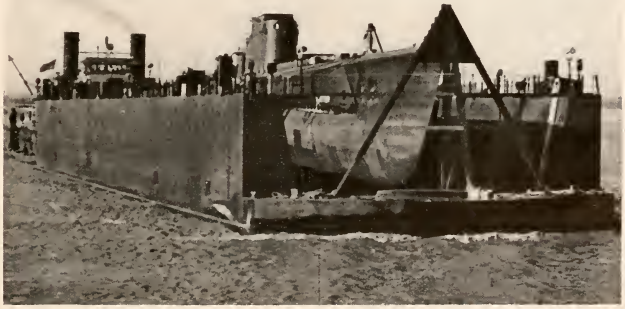
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This leading industrialist received both his high school and college training at Lewis Institute, from which he graduated in 1908 as a Mechanical Engineer.

After nine years association with the People's Gas Light and Coke Company of Chicago, Dr. Rafferty made a change in occupation in 1917 which was to bring him into the Union Carbide and Carbon Corporation, the parent company of the Carbide and Chemicals Corporation. He transferred to the Linde Air Products Company, which a few months later joined with a number of other companies to form Union Carbide. Some three years afterward, Carbide and Carbon Chemicals was formed as a unit of this organization. As General Manager, Vice President and finally President of this pioneering enterprise, Mr. Rafferty developed it from its small beginnings in a shack and compressor station in the West Virginia hills to its present dominat-



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ing position with a plant at South Charleston, W. Va., the largest single chemicals property in the country, and other plants at Whiting, Ind., Texas City, Texas, and Niagara Falls, N. Y.

In addition to being President of Carbide and Carbon Chemicals Corporation (1929), Mr. Rafferty is President of the Bakelite Corporation and a Director of several other units of the Union Carbide and Carbon Corporation including the Linde Air Products Company, the Prest-O-Lite Company, Union Carbide and Carbon Research Laboratories, the Oxweld Railroad Service Company, and the Electro-Metallurgical Company.

WILLIAM FARGO SIMS, Chief Electrical Engineer (Retired) of the Commonwealth Edison Company, was cited "For eminent leadership in the organization, design, and operation of one of the largest electric power generation, transmission, and distribution systems in the world; and for his understanding and stimulation of scientific research in the development and application of equipment for electric power systems."

Dr. Sims was a member of the class of '97 of Armour Institute of Technology, the first to graduate from the school. He took a Bachelor of Science degree in Electrical Engineering, and six years later received the degree of Electrical Engineer from his Alma Mater.

Most of his career has been spent in the field of telephonic communication. He was Assistant Engineer of the Chicago Telephone Company from 1897 to 1901, with an interval of military service as a second lieutenant of engineers in the Spanish American War. From 1901 to 1906 he was Assistant Engineer of the Chicago Edison Company. After nine years of activity in other fields, he returned to

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telephony in 1916, becoming field engineer for the Commonwealth Edison Company. He was made Engineer of the Inside Plant in 1930 and Chief Electrical Engineer in 1932. He retired from active duty last August.

Dr. Sims has headed important electric equipment committees of the National Electric Light Association, the Edison Electric Institute and the Association of Edison Illuminating Companies. He is a Fellow of the American Institute of Electrical Engineers.

CHARLES FREDERICK WAGNER, Consulting Transmission Engineer of the Westinghouse Electric and Manufacturing Company, was cited "For pioneering research in the application of symmetrical components to power system analyses; for his outstanding contributions to the modern theories of synchronous and induction machine performances; and for his leadership in the investigation of natural lighting phenomena and the application of knowledge regarding lightning to the protection of electrical systems."

Dr. Wagner has been with Westinghouse ever since he completed his academic training with a year of graduate study at the University of Chicago. He had graduated from Carnegie Tech in 1917 with a Bachelor of Science Degree in Electrical Engineering. He was employed in the research engineering division for his first seven years with the Company. He was transferred from this division to the department concerned with transmission development, and was made Consulting Transmission Engineer in 1938. He was appointed Manager of the Central Station Engineering Department in 1941.

His writing has made him widely known. He is the author of many technical papers published in the United States and abroad and co-author of *Symmetrical Components,* which is in general use as a college textbook and as a book of reference for practicing engineers.

Before the last commencement, Illinois Institute and its parent bodies, Armour and Lewis, had conferred a total of twenty-two honorary degrees. The list is as follows:

Armour Institute of Technology

John Findlay Wallace, Doctor of Science, June 16, 1904.

Charles Sumner Howe, Doctor of Science, June 15, 1905.

William Thomas McClement, Doctor of Science, June 14, 1906.

Bion Joseph Arnold, Doctor of Science, June 13, 1907.

Bernard Edward Sunny, Doctor of Engineering, June 4, 1908.

Walter Francis Shattuck, Doctor of Science, May 25, 1916.

Mortimer Elwyn Cooley, Doctor of Science, May 31, 1923.

Franklin Martin de Beers, Master of Science, June 10, 1926.

Gustave Whyte Thompson, Doctor of Science, June 9, 1927.

Francis Gladheim Pease, Doctor of Science, June 9, 1927.

James Huston Felgar, Doctor of Engineering, June 6, 1929.

Dana Pierce, Doctor of Engineering, June 12, 1930.

Howard L. Krum, Doctor of Engineering, June 8, 1939.

Joseph S. Duncan, Doctor of Engineering, June 8, 1939.

Alfred Leroy Eustice, Doctor of Engineering, June 6, 1940.

Gustav Egloff, Doctor of Science, June 6, 1940.

Lewis Institute

George Noble Carman, Doctor of Laws, June 19, 1930.

Lee De Forest, Doctor of Engineering, June 23, 1937.

Illinois Institute of Technology

Charles Donald Dallas, Doctor of Engineering, June 12, 1941.

Joshua D'Esposito, Doctor of Engineering, June 12, 1941.

Richard Henry Whitehead, Doctor of Engineering, June 12, 1941.

Wilfred Sykes, Doctor of Engineering, Feb. 3, 1943.

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## GAS INSTITUTE

(From page 27)

projects cannot be publicized, although it is permissible to reveal that several investigations are related to the fluidizing process. Work on gas fired appliances is under way for six sponsors, with several other projects held in abeyance because of man power shortage. Mechanical engineers are in particular demand!

In the basic research program, work is progressing in two different fields. In manufactured gas, the general objective is the production of high heating value gas by a continuous, low-cost high pressure process. At least two related projects are definitely planned for this field, one using fluidization and the other employing the Gas Institute's newly invented flash pulverizing technique. A vigorous study of the latter subject, first given public mention in the last issue of the *Engineer and Alumnus,* has shown tremendous possibilities for this new process, not only in the gas industry but also in many other applications.

For natural gas, the program is directed towards the production, through catalytic reactions, of more valuable products than the originally available methane, propane, and butane. High pressure water-gas reactions, of particular interest in the re-cycling process, are also to be studied.

Several new staff appointments have been made during the past month, with the intention of strengthening both the research and educational phases of the Institute's program. Dr. Eric Lype, Dip. Ing., Charlottenburg, 1931, Dr. Sci. in Eng., Zurich, 1938, has been engaged to specialize in problems related to heat transfer, thermodynamics, and gas turbines. Dr. Lype comes to the Institute after five years of experience in the engineering department of Combustion Engineering Co. of New York and the gas turbine department of the De Laval Steam Turbine Company. Until the re-establishment of the educational program, Dr. Lype will work on sponsored and basic projects related to his field of special interest. When graduate study becomes possible again, he will teach advanced courses in heat transfer, kinetic theory, and similar subjects.

Dr. J. J. S. Sebastian comes to the Institute after fourteen years of coal research at the Mellon Institute and at Carnegie Institute of Technology. Dr. Sebastian obtained the degree of Chemical Engineer from the Royal Polytechnic Institute of Budapest, while Carnegie Tech gave him the degree of Doctor of Science in 1935. He will engage in research on gas generation in both the sponsored and the basic phases of the Institute's research program.

Interest in the Institute is increasing in the gas industry, for three new member companies have been added during the past month. The Portland Gas and Coke Company, Continental Carbon Company, and Mills Industries, Incorporated, have become associate members, while four members of the New England Power Association have made valued contributions. The total budget of the Institute for 1943-44 will approach $250,000. A sound structure is being built upon the foundation which was laid during the first two years of the Gas Institute by the Organizing Committee, by President Heald, and Mr. Vagtborg.

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# IT HAPPENED AT ILLINOIS TECH

## in 1943

In the daily life at a large college, one day follows another without much departure from the business of classroom and lab routine. Things go on apace, however, behind the scenes. Some we learn about as we go, others take place under the veil of scientific secrecy. But, when viewed in retrospect, the accomplishments of a year's work assume huge proportions. . . . In a war year like '43, civilian training and military training, too, are seen in their proper relationship to the needs of the times. . . . We have set down here some of the accomplishments of the college in 1943. As the days following graduation pass into years, you may want to know "What did my college do in the war year of 1943." This page will be an interesting reminder.

**TRAINING ENGINEERS AND SCIENTISTS.** To help alleviate the acute shortage of men and women in all branches of engineering and science, whether in civilian or military activity, Illinois Institute of Technology carried on its regular courses, graduating a total of 437 men and 47 women.

**ROUND-THE-CALENDAR EDUCATION.** In July, 1943, Illinois Tech went on the accelerated plan of three 16-week terms. Students of 1943 will recall Thanksgiving as just another day in classrooms. Those with early classes will remember how the first class started at 7:30 a.m. instead of 8:10 a.m.



CHICAGO SUN PHOTO

**DEVELOPMENT PROGRAM.** On January 11, 1943, the quarter-million dollar Metals and Minerals Research Building for the Armour Research Foundation, the first unit in the $3,100,000 campus development project was dedicated. The illustration here is of President Heald participating in the dedication ceremony. Construction has been started, and is now nearing completion on the Automotive Research Laboratory Building for the Armour Research Foundation and on the Parmly Foundation for Auditory Research Building.

**BLOOD DONATING RECORD.** Illinois Tech was the first college in this area to donate sufficient blood for the Red Cross Mobile Unit to visit, not once but three times in '43! 381 pints were donated in three days during the first visit . . . the most given in three days up to that time to a Mobile Unit. Again in August, 512 pints set a still higher record. A total of 1138 pints of blood was donated by the students during 1943.



CHICAGO TRIBUNE PHOTO

**RESEARCH.** The very nature of this work under war time restrictions veils itself in secrecy. The veil can only be lifted after the war is over. More than 30 different projects, however, are under way at Illinois Tech.

In 1943 the erection of the wind tunnel was completed. The electron microscope, a rare, scientific instrument, became available. It is the only one in the Chicago area, the 34th in the nation, and the 41st in the world.

**STUDENT WAR COUNCIL.** Organized in January, 1942. Carried on the good work through 1943, becoming very active in the salvage drive. Assumed full responsibility for posting of Air Raid notices around the schools. Assisted in rationing negotiations in a suburban school district where an insufficient number of teachers was available for this purpose.

**WAR TRAINING PROGRAM.** In 1943 Illinois Tech retained its position of operating the largest war training program (ESMWT) in a single city in America. Forty-two thousand persons have been enrolled up to December 31, 1943. Thirty-four thousand since Pearl Harbor . . . 22,574 this year. In 1943 the emphasis changed to In-Plant courses. More than thirty plants now have such schools operated by Illinois Tech. The fulltime pre-employment courses for women also reached their peak in 1943. The illustration here is of the 1000th woman graduating from these courses. More than 1100 women have been trained as war technicians by Illinois Institute of Technology, of which 563 graduated in 1943.



LOOP PHOTO

**SIGNAL CORPS TRAINING SCHOOL.** At the request of the United States Signal Corps, this program was inaugurated in 1942 and carried through to completion in 1943. 4,316 students in pre-radar were trained. To provide classrooms equipped for the purpose, Illinois Tech took over a garage building, called it Pre-Radar Hall, and leased the Northern Illinois College of Optometry. The school was closed July 31 when the student instruction in this course was completed.

**EXPLOSIVES SAFETY SCHOOL.** Formally known as the "School for Safety Auditors," this school was established in August, 1942, at the request of the Office of the Chief of Ordnance, War Department. Illinois Tech was selected to organize and administer this school for two reasons: (1) its outstanding war training record (2) its work in conducting the nation's only Department of Fire Protection Engineering. The instruction carried on through 1943, training munitions experts to take places in varying capacities in 600-odd munitions plants. Students in this school are specially selected by the Army and Civil Service. Of the total of 366 trained, 251 graduated in 1943.



LOOP PHOTO

**STUDENTS IN UNIFORM.** Both the Army (ASTP) and Navy (V-12) came to Illinois Tech in 1943. Thus, Illinois Tech became one of a few colleges with both Army and Navy men in the student body. Approximately 700 Navy men and 500 Army cadets attended Illinois Tech at all times. The Navy men were a part of regular college activities, while the soldiers attended classes conducted exclusively for them.

Illinois Tech

CONSOLIDATION OF ARMOUR AND LEWIS INSTITUTES

3300 S. FEDERAL ST. CHICAGO 16, ILLINOIS PHONE VICTORY 7200

(A page from the 1944 *Integral,* student yearbook of Illinois Institute of Technology. It is reproduced here for its news value to readers of the *Illinois Tech Engineer and Alumnus*—and because it is felt that it will be of more interest than any page of advertising Illinois Tech might present.)

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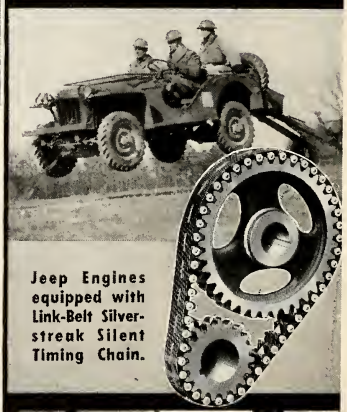
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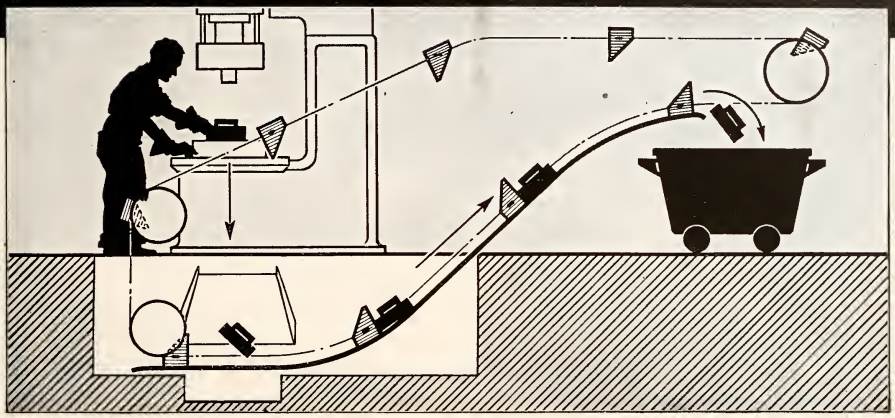
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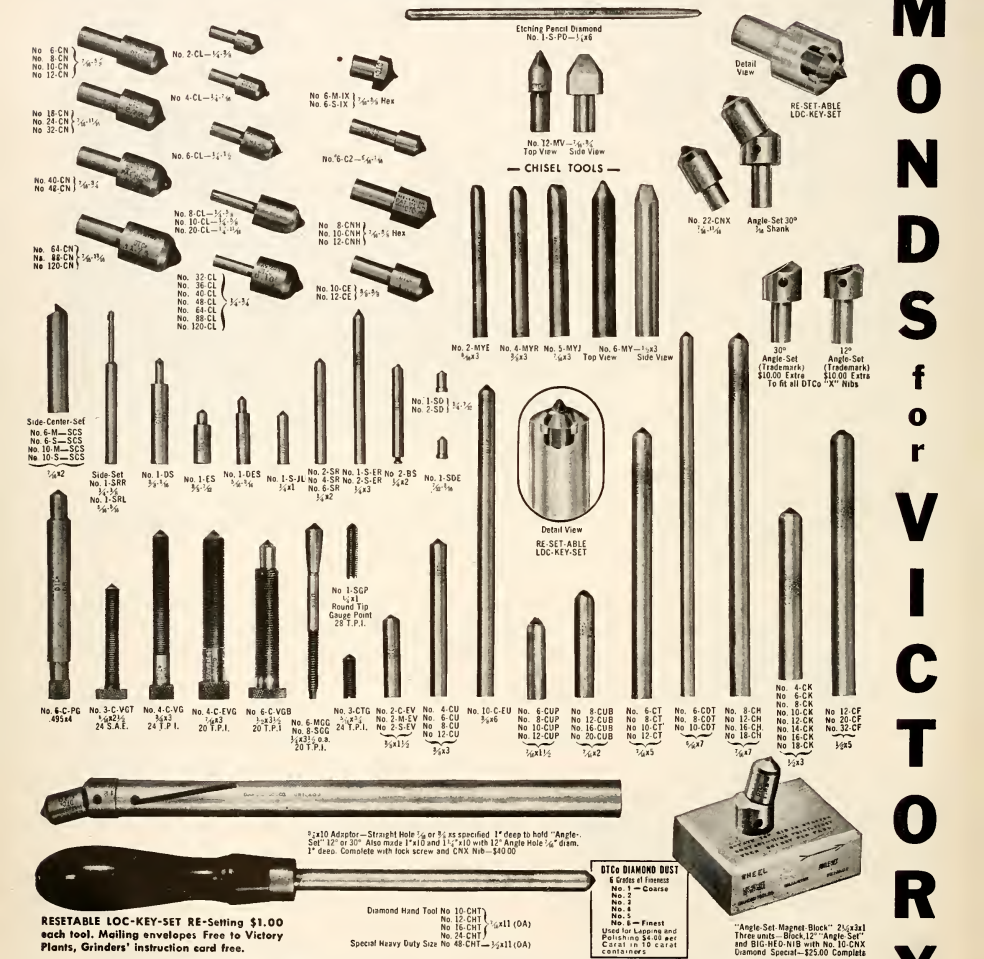
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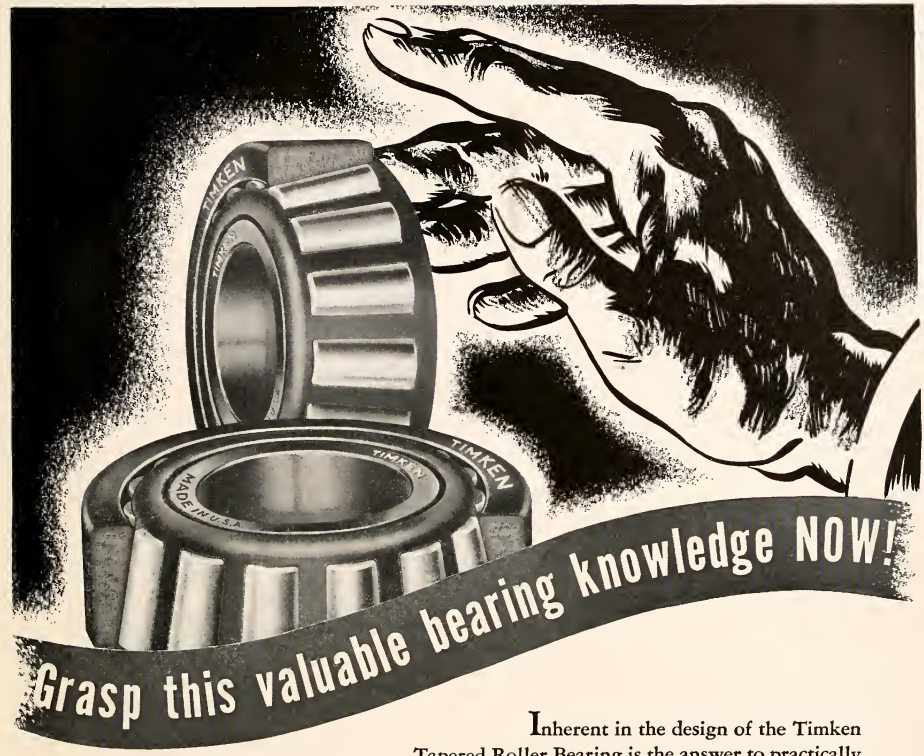
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